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NUPE AND ILORIN.*

By SEYMOUR VANDELEUR, D.S.O., Lieut. Scots Guards.

I had so recently the honour of addressing the Royal Geographical Society on a very different part of Africa, that I feel rather diffident in speaking now about a country of which I have had such a short if varied experience, and my excuse must be that I have been induced to do so by others. It will be difficult to eliminate entirely the military from the geographical aspect of the journey, and I am afraid my attention was quite as much taken up with the former as with the latter.

After a long and tedious journey along the west coast of Africa, I arrived with other special service officers on December 26, 1896, at Forcados, in the delta of the Niger, a place which up to that time had been beyond the scope of most people's geographical knowledge, but was soon afterwards to become widely known as the starting-point of the Benin expedition. Here we were met by Mr. Flint, the energetic agent-general of the Royal Niger Company, who is in charge of all the lower part of the river, and were rapidly taken up in his launch to Lokoja. The lower Niger is too well known to need any description by me, and it will be enough to say that on the second day we left the Forcados branch of the Niger, and entered the main river, up which we steamed for another three days before reaching Lokoja, 300 miles from the mouth. The scenery on approaching this place is very fine, and the river winds through high hills of curious shapes, which is a relief after the flat and uninteresting scenery of the lower river. It was a busy scene here, as preparations were being rapidly made for the forthcoming expedition.

* Read at the Royal Geographical Society, May 31, 1897. Map, p. 464.

Whilst at Lokoja I went down to the chief Abbega's house to see a dance by various tribes, and it was really as curious a performance as one could wish to see. Women, supposed to be possessed of the devil, jumped up into the air, and then came down in a sitting posture, which was meant to squash the devil. The women who did this were usually old and unwieldy, but they repeated it several times, although it must have occasioned them a good deal of pain. Some men made an iron red hot, and then rubbed their feet along it, one even licking it with his tongue, and one could hear the hissing of the burning flesh. The natives are mostly Mohammedans, and what astonished me particularly, after coming from the East Coast, was the enormous amount of cloth which is worn by the people of these parts.

A great deal of work had to be done in getting the instruments ready and rating the chronometers, and on the day before starting I went up to the top of Mount Pati, a high table mountain lying close behind Lokoja, and 1400 feet above the sea. There is a fine view from here over the confluence of the rivers Benue and Niger, where at this time of year a large extent of sandbank is uncovered, but it was spoilt by the Harmattan wind. This wind, bringing with it minute particles of sand from the Sahara, which obscure the atmosphere, is a perfect curse to the geographer, although it may be the means of keeping off some of the hot rays of the sun. Hills not far distant appear dim and indefinite as in a London fog, and it is impossible to select any point on which to take a bearing.

Everything being organized, we marched out of Lokoja on Wednesday, January 6. A long line it was, with about nine hundred carriers and five hundred soldiers, all in single file, and the column must have extended for over two miles. Threading our way through the town, we passed the magazine fort, and marched in a northerly direction, with the river Niger close to our right and a high range of hills to our left. These hills form a series of buttresses jutting out at regular intervals towards the river, and are divided by streams or rivulets, which make their way down through narrow valleys from the high ground of the interior. It was up one of these valleys we turned in a north-westerly direction after going for two miles, and made our camp at Felela Busa. As might be expected with such a large caravan, starting was not at all *couleur de rose*, and many loads had to be repacked and readjusted. Three hundred of the porters were drawn from the coast, among them being Fantis, Ashantis, and natives from Accra and Lagos; the remaining six hundred being Hausas and Yorubas drawn from the country itself, and the latter were far and away the best and strongest. They struck me as being much better clothed than the East Coast porter, though one could not say this at the end of the expedition, as they had literally lost or sold nearly all their clothes. They were much quieter on the march than the porters of the east, and did not sing like them.

Pursuing the same direction, we came to the small village of Emu on the morning of the 8th, after crossing the small river Gadwanga, and the hills still loomed up in the mist on each side of us. The country, covered with grass 3 feet high and low trees, was very dry and burnt up, and it was a relief to see green palm trees on the banks of the stream, along the course of which we continued for the rest of the day. We camped under a high hill, on the top of which lies the village of Jakuro, which we reached the next morning, situated among a lot of rocks, and shaded by magnificent trees. The houses built by the people here are made of mud and wattle in an oblong shape, with

MARCH TO KABBA.
(From a photograph by Dr. Crasler.)

thatched roofs, and around the village were small fields of dhurra. The country now became more hilly and undulating, and we made our way by a rocky path sometimes along narrow ridges, and up and down steep declivities, with always the same arid and barren aspect on all sides. There were no shady trees to keep off the rays of the sun, which was very hot in the middle of the day, and as we ascended to the high ground, the difference of temperature became very marked, the minimum for this day being 59°, and the temperature even at 4 p.m., with a swing thermometer, being 94°. We had ascended a great deal since leaving the Niger, and were already at a height of 1000 feet above the sea. Our camp near the village of Akpara, on the 11th inst., was one of our highest points, by boiling-point 1480 feet above the sea, and

it is pleasant to think that behind the low and malarious west coast of Africa and delta of the Niger, there are these fine healthy uplands, where the nights are cool.

Signs of the slave-raiders were now becoming apparent, and we passed two deserted villages which had been raided and burnt by the Bida people; only the blackened walls remained. The country had been completely depopulated by the continuous raids, and the unfortunate natives lived in constant dread of being captured and sent off into the depths of the Western Sudan, with the alternative of dashing off into the bush with their children and some food, and emerging to find their homesteads burnt to the ground.

Akpara, the biggest place we had yet come across, was prettily situated on some high ground with small peaks on each side, and was surrounded by an abundance of plantains, yams, and oranges, the path leading through an avenue of fine trees. The natives crowded together at the cross-roads to see the column pass through, and were mostly dressed in native cloth dyed blue with indigo. After leaving Akpara, the country was barren and deserted until we reached Sura. On January 11, we gradually neared the high rocky hill which is called Pati Sura, under which lies the village, and before halting had a fine view across a valley to the north of Sura, towards a range of hills in the distance. From this place, which is in lat. 8° 5′ 43″ N., we altered our course altogether, and steered in a southerly direction to Kabba, the position of which town was at that time uncertain. The track led us close along the base of Pati Sura, and then across a plain covered with low trees and scrub to another ridge of hills, at the base of which we found the river Mimi flowing, a lovely stream of about 30 feet broad, which drains all this country, and runs into the Niger two miles below Lokoja.

We were going along as fast as we could now, without tents and only carrying light loads, and, with the exception of two hours' halt in the middle of the day at the Mimi river and minor halts, we travelled all day. In the afternoon the country became more thickly wooded, and just before halting we reached the village of Epi, hidden away in a dense belt of forest. In the open glades round the houses a great deal of tobacco, yams, and cotton is grown, and the soil seemed very fertile. It was quite like going from light into darkness, and the trees entwined themselves over our heads. We camped on the further side of the forest, at a height of 1660 feet; the monotony of the journey being only broken by the capture of a "dankary," or Nupe soldier, in the grass at the side of the road, who was probably a spy watching our movements. He made a bold bid for freedom, and dashed off into the bush from his captors, being instantly pursued by some carriers and Hausa soldiers, who brought him back in triumph—not, however, without his having bitten a carrier very badly in the mouth before he could be recaptured.

Notwithstanding all efforts to guard him, he managed to escape during the night, and created an alarm in the camp.

When we started the next morning it was very misty, and the grass, here very luxuriant and about 4 feet high, soon wetted every one through and through, until, after going 8 miles, we reached a lovely open country covered with scattered palm trees. We now turned westward again, and crossed a green valley, where signs still remained of a large encampment, probably used by the Fulas some years ago. Two little hills in front gave us our direction, and, after passing

MARCH TO KABBA.
(*From a photograph by Dr. Crozier.*)

between them, we could see the curious-shaped rocky hill at Kabba, and reached the wall of that town at one o'clock after eight days' march from Lokoja. It is a most picturesque place, lying among pine woods, and evidently a shadow of what it had been once upon a time. The mud wall plainly shows the former extent of the town—over a mile from one side to the other—which has been so reduced by raids and slavery for the last quarter of a century, that now there cannot be more than 5000 inhabitants.

The Fula war-camp was situated 4 miles further on, and consisted of an enormous collection of thatched huts and enclosures, covering over a square mile of country. Situated on a slight eminence, the ground round is fairly open, and covered with dried-up grass 3 feet in

height and isolated palm trees. Rocky hills with precipitous sides rise up on each side about 2 miles distant, and form a sort of line of outposts to the camp; the top of one of these overhangs the base to such an extent, that one wonders how it does not overbalance and tumble over. It is a fine country for horses, and there were signs of many of them about the camp, but the Fulas had preferred not to risk an engagement.

The important towns of Gidi and Aieri lie out in this direction. On our return to Kabba, an imposing ceremony was held in the market-place of the town, where the governor met the chiefs of Kabba and neighbouring towns, and formally proclaimed the freedom of Southern Nupe from the Fula power and the cessation of slavery. The whole force paraded and formed up in two columns facing the town, the seven-pounders drawn by ropes in the centre. The dark green background formed by Kabba hill was covered with groups of natives, perched together on the rocks, and was relieved by the touches of colour of the chiefs' robes. The old king himself was dressed in a red and gold gown very much faded, and a red tarboosh with blue tassel, the others wearing red, blue, and yellow tobes.

Very good cloth is made in the Western Sudan, and there is a great industry at Kano, where cloth is dyed blue with indigo. A great deal of it is worn on the body, and often immense folds wound round the head as a turban. The natives are ugly and unprepossessing, and bear traces of the slavery which has laid such a heavy hand on them. We arrived back at the camp we had left at Sura with the reserve supplies on the 16th, where we found all well; and, after a halt of one day, started on our march to Egbon, which was now almost due north of us. After leaving Sura village the country was wooded and uninhabited, and we descended gradually over rocky and gravelly soil to the Feraji river, which flows to the eastward north of Akpara. Five miles further on we reached the village, which bears the same name, where there is lovely clear water drawn from wells. The country round is very thickly wooded; a great deal of cotton is grown, and I noticed women in a house at work on the looms, which are most ingenious. Just before reaching Feraji we passed by the left of a range of hills running east and west, and I was able to get a glimpse of the country in front of us by ascending a small hill near the track. It seemed fairly level, though to the westward two or three high hills were noticeable.

On the 19th we reached a watercourse and re-entrant into the hills, up which we advanced, and camped beyond the village of Shale. This was an interesting point for us, as we noticed the water was now flowing the other way in a northerly direction into the middle Niger. The country became very barren and arid as we approached the Jakpana hills, and at a cross-roads just before reaching them, a little path led down to a water-hole, which, after being cleared out assiduously, yielded

about three pints of very dirty water. We ascended the hills by a steep path over stony and volcanic ground, some of the lava rocks over which we marched being extremely hot and trying to the naked feet of the porters, and it was a difficult march for them. There are three distinct peaks, the centre being a triangular rock without a particle of vegetation on it, which is visible for many miles, and would seem to have been specially placed there as a point for surveying. We passed over the col between two of the small peaks, and descended into the valley the other side. Before leaving the ridge we had a fine view over the valley to

MARKET CANOE AT EGGA.
(*From a photograph by the Earl of Scarborough.*)

the west, and, on looking back, two twin peaks of no inconsiderable size, which we had hitherto missed seeing owing to the thick bush, now came into view, forming a gateway at the end of the valley. From this elevation, 1180 feet above the sea, we descended into the plain which borders the Niger, and as we left the rugged sides of the hills, fields of cultivation appeared, and the country became much more prosperous looking. Here we first came upon a Nupe village—Kosobeji by name—utterly different to any village we had yet seen, and remarkable for the neatness of its walls and the structure of its houses; these were nearly all circular, and made of red mud walls with very neatly thatched roofs. Intermingled with little structures of the same

sort for grain, raised from the ground, they were crowded together into the smallest space imaginable, so that one wondered how the natives could move about among them. Nearly every house had a miniature courtyard, separated from the next house by a small wall. An enormous quantity of corn was found here, and it proved to be a food depôt of the southern Nupe army, which had been dispersed at Kabba.

From Kosobeji, a very gradual descent across a great plain covered with dry grass 4 feet high led to the Kampi river, at this time only a few yards broad, but which is evidently a very fine river in the rains, about 150 yards broad, flowing between sandy banks, and emptying itself into the Niger near Egga. As I noticed throughout, this country would present an utterly different appearance in the rains; little ravines and sandy river-beds, which we crossed dryshod, doubtless become seething torrents, and render travelling very difficult, if not impossible, for caravans loaded as we were. On approaching the Kampi river in the early morning, a peak towards Egbon loomed up out of the mist in the distance, the very image of one of the pyramids in Egypt, the side turned to us being lit up by the sun's rays with a beautiful soft yellow colouring, strengthened by the blue shadows on the edges, whilst away over the brown dried-up grass a belt of dark green palm trees indicated the course of the river, making a brilliant contrast with the surrounding country. An hour further on we reached Padda, a large Nupe town of 4000 to 5000 inhabitants, which was flying the Company's flag, and contained many fine circular houses and markets. The people were friendly, and brought out plenty of food—plantains, chickens, and eggs—to the camp, which was posted on an undulation to the west of the town. A road branches off here to Egga, keeping to the north side of the river Kampi. From Padda we soon reached the Niger, passing to the right of three of those curious flat-topped hills peculiar to West Africa, which rose up almost perpendicularly from the ground, echeloned from right to left. They are called the Egbon hills, and are visible from a ridge near Bida; the pyramid peak lies a little to the south of them. Between Padda and the river several small farms, with fields of cultivation round, lie scattered about, the property of the Nupe princes, and worked by their slaves, sent across the river for the purpose.

It was pleasant to see the great river again, after seventeen days' marching through the bush, and we camped at Egbon, a small village, where there was an open space in the woods which border the river, and where the bank shelved steeply down to the water's edge. Close to the side lay the flotilla of armed stern-wheelers and launches which had made their way up from Lokoja under Mr. Wallace, C.M.G., at the beginning of the month, for the purpose of patrolling this portion of the middle Niger; and we realized the advantages of sea power, or what would be more appropriately called river power, by replenishing our stock of provisions, which were by this time running somewhat

short, and getting a certain amount of soda-water, which was a treat after some of the liquid we had been obliged to drink *en route*. The patrolling had been most successful, and by the strategy adopted the two Nupe armies were effectually separated.

Before crossing the river, it may be interesting to give some account of the people against whom we were proceeding. The rulers of all the Hausa states in the Western Sudan are a race known as Fulas. Resembling the Wahuma in Uganda and the Lake regions, they are lighter in colour, taller, and finer looking than the indigenous population. Their history is unknown, but they would seem to be an offshoot of the great race of Gallas in Somaliland and North-East Africa. Coming from the north,

NUPE VILLAGE.
(*From a photograph by Joseph Thomson.*)

they gradually asserted their superiority, and conquered this country by means of superior military organization and skill, and the havoc wrought by their cavalry. It is hard to realize at home the enormous population existing in Hausaland, which forms the larger portion of Sokoto and Gando. It is estimated by Mr. Robinson at fifteen millions, or one per cent of the world's population, and of these a large proportion are slaves, who, in fact, form a species of coinage in the country. Nupe has always been one of the largest and most important states in the Sokoto empire, and the emir is said to have declared at one time that his rule extended from Guari or Zaria in the north to Asaba in the south, and from Bussa in the west to Keffi in the east—literally, over about 70,000 square miles of country.

Masaba, the founder of the Fula dynasty in Nupe, was a Sokoto prince, related to Othman wad Fodio, the African Napoleon, who, at the commencement of this century, created the immense Fula empire of Sokoto and Gando. Masaba was so deeply indebted to one of his generals, Omru, that he decreed that Omru, though not of royal blood, should succeed him on the throne of Nupe, subject to the assent of Sokoto, but on condition that on Omru's death the throne should return to Masaba's family. Accordingly, Meliki, a Masaba, succeeded Omru, while Muhammed, Omru's eldest son, was given the rank of Markum, or third in succession to the throne, the heir-apparent always holding the rank of Sheaba, and the next heir that of Potum. During Meliki's reign the rank of heir-apparent or Sheaba died out, as successive holders died of poison—one of the disadvantages of having anything to do with the throne in these countries—so that the Potum, Abu Bekri, a Masaba, refused to accept the rank which was left vacant. On Meliki's death, in 1895, Abu Bekri became Emir, or Sultan, and it is with him that the troubles which led to the expedition began, and the Markum Muhammed is the man who has been recently appointed Emir. The Hausas themselves are an intelligent race of traders, and capable of much development. That they can be made into good soldiers was proved during this expedition, and although Mohammedans, the religious question did not occasion any difficulty.

On January 23 we commenced to cross the Niger, which is here about 800 yards broad, and found high grass and very thick bush on the northern bank, through which we made our way by a circuitous path to a creek 2½ miles from the river. This proved to be rather an obstacle, as it was very deep, and on the day following a man was drowned there. Two native canoes were found in the creek, and a steel canoe was transported here from the river, by means of which the crossing of the whole force was effected. This was not the only obstacle in the way, for on the day following a swamp nearly 200 yards broad was met with, which reminded me much of the river swamps in the Lake regions, with the exception of the papyrus, which, fortunately, does not exist in this country. The heavy guns were sadly encumbered by it, and it took severe exertions to get them through. After leaving the swamp we passed several villages and plantain groves, the country being very flat and wooded.

Before reaching the village of Lokicha, where we camped, we had to cross another small swamp, fringed with palm trees. Villages now became very numerous, and the country was thickly populated. On all sides were fields of cultivation, and it was here we came into touch with the enemy, who opposed our advance for the remainder of the march to Bida. As the parties of cavalry were driven back, and we neared the city, the enclosed country gave way to enormous open undulating plains, with here and there a village or farm nestling among a small clump of

trees. It was an ideal battle-field, and as we came down to the ravine, or nullah, through which flows the Rafi Shanu stream, we could see the Nupe army extended along the opposite ridge, and as they retired, and we surmounted this ridge, we had a really magnificent sight towards the town, outside the gates of which, and on the further side of the stream, which passes through the southern portion of the town, were drawn up the Emir and Nupe princes, and the whole of the Nupe army. We were forced to retire on this day, and it was only on the second day that we were able to advance in square with the guns and take the town.

The Fula army consists of hordes of irregular cavalry, with bands of footmen. Firmly fixed in their high-peaked saddles, with enormous

TAKING GUNS ACROSS CREEK.
(From a photograph by Dr. Crasler.)

brass and iron stirrups, they galloped along on their long-tailed ponies, covered with gay trappings, waving their swords or spears in the air, with their white robes flying in the wind, accompanied at the same time by the clamour of their small drums, and the deep-based horns which were encouraging them to the attack. Very often an enormous straw hat surmounted the turban which was wound round their heads, or was allowed to fall back and hang over the shoulder. Some of the leaders were splendidly dressed, and wore flat-heeled riding-boots of red leather, which are excellently made in this country.

Bida is a striking place to find in Central Africa, and makes all the

more impression on one, after one has arrived at it from the delta of the Niger, where the natives are of the lowest order of civilization, and a most degraded-looking race, with instincts tending to cannibalism. It is situated on slightly rising ground, and watered by two streams, one of which rises only a short way from the walls; these join together in the southern portion of the town, and flow through a beautifully green valley to the east. A strong wall, 10 feet high, made of red clay, and crenelated with ditch in front, extends round the town, broken down in a few places, and from where we first saw it there appeared to be a mass of lofty thatched houses and high walls, forming enclosures, which, intermingled with fine trees, extended to the north as far as the eye could reach.

It was on January 29 that, as some paper described it, Sir George Goldie made his triumphal entry into Benin, which is as far off from Bida as Paris is from London, and with no railway connection between the two. The main thoroughfares are fairly broad, and lead from one gate to another, bordered by great enclosures and compounds surrounded by lofty walls excellently made, and often 18 feet in height, and the doorways are in some cases roughly carved outside. The walls of the large buildings are very massive, and very often the roofs of the rooms are arched and supported on pillars of black clay, which is polished, and looks exactly like stone. The principal of these palaces are those occupied by the princes of the two great families, the Massaba and Omru. Outside the late Emir Meliki's palace lies the slave-market, where formerly it used to be a common sight to see two hundred slaves exposed of an evening for sale to the highest bidder. Unfortunate creatures raided from various parts of the kingdom, even south of Lokoja in the Company's territories, they used to be sold here as a source of revenue to the Nupe princes.

The entrance to the Emir's palace is covered with a high dome made of bamboos resting on thick walls, and supported at the bottom by short carved wooden pillars. Some tame ostriches and a deer were the sole occupants left in the big outer enclosure, in one of the numerous inner courts of which there is a lovely well of pure water. A great variety of articles were found, including some very good swords, an English general's sword, a claymore, and, curiously enough, a sword belonging to an officer in the 11th Hussars, with a monogram and coronet on it. About 350 rifles, with several tons of gunpowder, different-coloured cloths, silks, and an innumerable quantity of brass basins, lay heaped up on the square. Between the main roads there is a network of narrow streets with walls on each side, and there are many mosques, though none of any size or importance. Round Bida there are some curious little hills of red sandstone, and to the east a stream leads to the Wanangi creek, which in the rainy season forms the nearest means of approach, boats being able to come up to it from the Niger.

On the 31st the governor left the town to meet a large body of traders at the Zongo camp, not far from the walls of the town. A curious assemblage they were, collected from all parts of the Hausa states and the Sokoto empire. Some came from Kano, and others from Kuka on Lake Chad, the inland sea in this western half of Africa, where the valuable blocks of potash are found. There were even traders from Tripoli on the Mediterranean, distinguishable from the others by their spotless white garments and red fezzes; and amongst them stood the inevitable Arab, light coloured, and with black flowing beard, the very picture of a slave-dealer. They were told that they could in future use the shorter route *viâ* Kano, Zaria and Keffi to Lokoja, instead of coming to Bida, where they would be able to dispose of their goods on the Niger, and would not be taxed in any way. The importance of

FULAS ON THE MARCH.

this trade question, and the opening up of the Niger territories, will be understood when it is realized that at present most of the European goods come across the great Sahara into the Hausa states from the north, several thousand camel-loads of goods coming annually into Kano from that direction, besides quantities of salt, which is in great demand, as it is found nowhere in Hausaland. Camels come down as far south as Bida.

After the governor had returned to the town, I accompanied Major Cunningham, D.S.O., on a reconnaissance to the north. A lovely open country lay spread out before us, across which one could apparently gallop for miles and miles. A few rocky hills stood out on the horizon,

and several villages, consisting of a few curious little circular houses, lay scattered about. As we approached one of them in a slight hollow near a rivulet, two of the enemy's horsemen came into sight, and, disregarding the shots fired at them, immediately galloped off, hotly pursued by a dashing Hussar officer, who died of fever, to our great sorrow, not long afterwards. He had a fast horse, and the wild horsemen of the Sudan were no match for him; a Nupe warrior was seen subsiding out of his unwieldy saddle and ponderous stirrups under the magnetic influence of a revolver-barrel. The horse was a good one, and far the more valuable capture of the two, but now the difficulty was how to secure the pair. This was soon solved by the Nupe making off into some thick grass as hard as his legs could carry him. A mile or two further on we reached a small hill, passing through a cloud of locusts, on the way, which quite obscured the atmosphere; and it was at a village just beyond this, called Sheshi, that we surprised a party of the enemy's horse, and made the lucky capture of Prince Esa, brother to the Markum Muhammed, and one of the most important Nupe princes. The villagers and the few natives we met on our return prostrated themselves on the ground when they saw him.

Bida is an interesting place, with its schools and institutions, and a great many books and boards with Arabic writing, also a very tattered old lion skin with a plan and some Arabic characters marked on it, were found here. There are numerous dye-pits in the town, and indigo forms a valuable article of commerce. The people themselves are great workers in leather, and make very good saddles, scabbards, and slippers; they are also workers in glass. The people are very superstitious, and carry charms wrapped up in little leather and leopard-skin cases, and they even tried to bring disaster upon us by planting little sticks with writing on in the pathway.

At Bida the average minimum temperature was 78°, and the maximum 97°, and we were not sorry to leave it on account of the plague of flies and other insects. It was under very different conditions we marched away across our old battle-field, and reached the former camp near the ravine, and the long line of porters, natives, and refugees extended for miles, confident of being no longer harassed by the enemy, and in danger of their lives. The nine-pounder had broken down, the wheel having been broken the day before, and it looked in a very helpless condition lying at the bottom of a ditch, and it was indeed lucky that this did not happen in the advance. The African porter, with his usual intelligence, decided that, after the fall of Bida, his work was at an end, and that loads of ammunition and provisions were quite a secondary consideration compared to his own loot—an enormous pile of usually the most inconceivable rubbish. With this he tried to steal out of camp in the morning, but was bitterly deceived when he arrived at the deep creek, 2½ miles from the river, and found people there to stop him.

A considerable number of officers and men were invalided from Egbon, and the remainder, consisting of 23 Europeans and 320 soldiers, embarked on the stern-wheelers and launches for transport to our new base at Jebba, a distance of over 90 miles. The night before we left a tornado of rain swept over the camp, making it very unpleasant for every one, and the rain soon penetrated the light sun-decks of the stern-wheelers, and came down in torrents on people underneath. We used to steam all day, and in the evening drew up alongside the bank, when the men were marched off the ship and bivouacked for the night, and we resumed our voyage early again the next morning. The river

FULA EMISSARIES ENTERING CAMP.
(*From a photograph by the Earl of Scarborough.*)

is about 600 yards broad, though narrower in places, and some of the reaches even remind one of the Thames, though one is soon disabused of this impression by coming across a native village, with a crowd of black people yelling and gesticulating on the bank. Especially was this the case at a large village called Babefu, where the people were in a great state of excitement, and ran along the bank with us to show their delight at the defeat of the Fulas. The river at Rabba, where the old capital used to be before the days of Bida, is quite lovely; the left bank is about 40 feet high, and rocky, but at the water's edge a few green bushes, and even some palm trees, have found a footing, whilst in

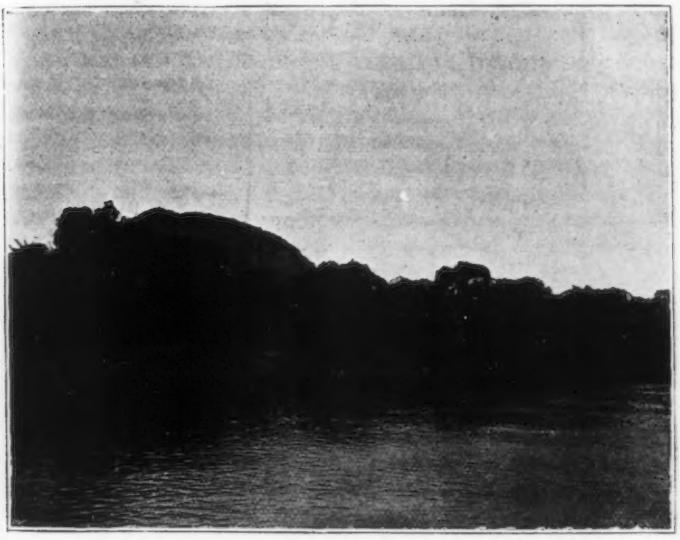
the distance an island divides the channel in two, and beyond it lie the hills behind Jebba. The stream is strong, and navigation intricate; our pilot was quite a character, and kept waving his thin, bony hand to the man at the wheel to point out the course. Jebba, where we arrived on the 8th inst., is very nearly the end of the navigable portion of the river for steamers and launches, as only a few miles up commence the rapids. High hills dominate the right bank, and we could see the high rock called Baikie's seat, which is defended from all intruders by swarms of bees. There is a large island in mid-stream, on which the Company's station and the native village are situated.

The Ilorin country, into which we were now going to march, is bounded by the Ibadan country on the south, which is governed from Lagos; and it was the fact of the Ilorins having attacked the frontier forts held by the Lagos Constabulary which brought on the present expedition. To the north-east lies Borgu, visited by Captain Lugard in 1894, and to the north, on the west side of the Niger, the Bussa country, which was recently entered by the French at the time we were fighting the Ilorins. On February 10 we started on our march south along the same route traversed by Mr. Fowler in his survey, but which I believe has never been described to this Society. Making a short march the first day, we reached a village called Bodi Sadu the next, which forms a regular sort of custom-house for taking toll from the traders who pass along the road. The country was frightfully burnt up and dry at this time of the year, and the difficulties of marching considerable. A sandy path led through low trees and bushes, and across, at times, open spaces covered with dried-up grass, and the aspect of the country during the first part of the march is very similar to the waterless plateau called the Haud in Somaliland. All food had to be carried, and the water in some places was very bad. On the third day, beyond an important village called Lanwa, the only water we could get to drink was unfit even to wash in, and very soon clogged all the filters brought to bear on it.

At first we travelled due south close to a range of hills, which was on our right, whilst on the other side lay the wooded valley in which runs the river Osin, flowing into the Niger not far from Jebba. Several dry watercourses were crossed, and on the 12th we camped at a small stream called the Orere. The small villages we came upon were similar to those we had seen in the march to Kabba, and consisted of big oblong houses, untidily thatched and tumbledown looking, very different from the neat huts in the Nupe country; these were usually arranged round a square, which forms a courtyard and market. The country improves vastly as one enters it and ascends on to the high ground, and there are some very fine trees—acacia trees with red fruit, and baobab trees, also a species of poplar; the villages are often surrounded by rubber trees and small banana groves.

Lanwa is a very large village, and was thronged with natives, mostly dressed in the blue native cloth. At the Arebi river, where we arrived on the 14th, we were already 1100 feet above the sea, having ascended 700 feet from the Niger at Jebba, and we camped near a village which was surrounded by fine rubber trees, slashed by matchets to get the rubber.

As we went on along the road to Ilorin the country began to assume more and more of a park-like appearance; as it was on approaching Bida, the tangled bush and undergrowth gave place to rolling plains, dotted about with fine trees of all sorts, and we passed little villages



RIVER NIGER.
(*From a photograph by Dr. Crosse.*)

hidden away in banana groves. At the first few villages we passed the natives remained at their doors, and everything seemed perfectly peaceful; but as we went on and came down the slope towards the Oyon river, it became apparent that we should have to fight before we entered the town of Ilorin, and we were soon afterwards attacked from all sides. Major Arnold pursued the same tactics as before, and on the second day the square advanced again to the walls of the town, which was entered that afternoon, the 16th, and too much praise cannot be given to the steadiness of the black soldiers. After crossing the Oyon river, a ridge was surmounted, and after passing through some villages and clumps of trees on the top, we came in sight of the town, which

lies on the further side of the Aza river. On all sides lay an open plain, broken here and there by a small village and some cultivation, and perhaps two or three isolated palm trees, and to the north the great Sobi rock formed a prominent feature of the landscape. The Hausa colony all took refuge with us on our approach, with their goods and chattels, and among them the soldiers recognized many of their own relations—the scene in rear of the position, where they were all collected, being a very strange one, and a perfect babel of sound went up from it. These Hausas, most of them peaceful traders, had wished to join us

INSIDE EMIN'S PALACE, ILORIN.
(*From a photograph by Dr. Craster.*)

before, but had been forcibly prevented from leaving the town. The Emir still refused to come to terms, and, after two hours' delay to allow of negotiation, the bombardment took place, and in the afternoon the force, preceded by the buglers, marched into the town to a large open space with shady trees in front of the Emir's enclosure. The first thing we noticed on entering the square was the gruesome spectacle of the corpse of some malefactor, having been probably executed with untold cruelties, and exposed as a warning to others on a heap of stones. The destruction of the palace—rather a misnomer for this collection of rude stone buildings—was indeed complete, and the market-place, where we pitched our tents, was still filled with the smoke and smell of burning. A curious episode was the fact of the "Fall in" for the guard being sounded that

evening in the market-place of Ilorin by an ex-bugler in the Lagos Constabulary, a few hours previously a slave in the same town, and still with the chains on his legs. Several of the soldiers found brothers and relations who were slaves in the town, and I believe several of them came away with us and enlisted.

The town, though not nearly so imposing as Bida, seemed to cover an immense area of ground, and I afterwards found out, whilst employed in making a plan of it, is 9 miles in circumference,

HAUSA PRIEST AND SOLDIER.
(*From a photograph by Dr. Crosse.*)

and, except on the north-east, surrounded by a dilapidated mud wall. From the many gateways well-used roads lead in all directions across the open grass country. To the south the houses become more detached, and a large extent of meadowland is enclosed within the outer wall. Magnificent baobab trees, affording splendid shade, adorn the open spaces in the town. The water-supply at this time of year is not first-rate, and there are only some evil-smelling stagnant pools of water at a few of the cross-roads, in addition to the

limited number of wells in the town itself, and the water is mostly drawn from the river Aza outside. The baloguns, or generals of the Ilorin army, and the chief traders have large enclosures and houses, and I entered one of these where a covered-in gateway, with a heavy wooden door made out of three planks about 9 feet in height, admitted one to a courtyard about 40 yards broad, round which the dwelling-houses were situated; the walls of these are massive, and in some cases roughly carved. The occupants had evidently left in great haste, and things were scattered about pell-mell in all directions; on the walls were fastened a few gaudy advertisements and pictures obtained from Lagos, and on the floor there were a number of Arabic manuscripts lying about. Through a door in the further wall one entered into an inner yard, where a lame horse was tethered, and round it there were more horses, probably for slaves and attendants. In the main doorway was fastened a miniature pair of leg-irons, such as is used for manacling slaves, which was reported to be a fetish of some kind to ward off the evil spirit.

The Emir and his chiefs had fled to villages far and wide, but were induced to surrender themselves, and on the 18th a small cavalcade, consisting of the former and his principal generals, arrived to make their peace. Mounted on their small horses covered with picturesque saddle-cloths and head-collars, they presented a curious appearance, and the old Emir himself looked an extraordinary sight with his head wrapt up in several folds of white cloth, forming a great bunch at the back of his head, one fold of which completely covered his face with the exception of his eyes and nose, and the whole was crowned by an enormous native straw hat. During the interview and the parade of troops which followed, they were very nervous and apprehensive of what might happen to them. The troops were drawn up in the square where the British flag was flying, and a treaty was signed giving complete power to the Niger Company over the country and settlement of the Lagos frontier, and the Emir was reinstated.

We set out from Ilorin on our return march on February 19, one of the hottest days I have felt, marching out of the town through what is known as the Hausa gate. Crowds of Hausa people, traders, refugees, and slaves, left the town with us, carrying their goods on donkeys and in baskets on their heads, and blocked up the road. The Harmattan wind was blowing during the march back to the river, and it was hot and dusty. At every few hundred yards little groups of men and women were sitting under shady trees to rest themselves on the journey, their loads lying on the ground near them. Some of the latter were enormous, and must have weighed fully 80 to 100 lbs. The Ilorins are a Yoruba-speaking people, and it is interesting to record that, according to Captain Mockler Ferryman, a desperate fight occurred in 1840 over exactly the same ground that we fought over, between the Yorubas, aided by a

small contingent of Borgus, and the Fulas, and that, after a prolonged contest, the latter eventually utterly routed the pagans, who had lost heart owing to the death of their leader.

Owing to the knowledge gained of the road and the watering-places, the return march of 52 miles was much quicker, and we reached Jebba in four days. Some of the Hausa people were transferred to the north bank to return to their homes; others were offered a free passage down to Lokoja in canoes. Curiously enough, although the middle of the dry season, the sky was nearly always dull and overcast at Jebba, and we had several small showers of rain. Fortunately, the night before we left there was a clear sky, and I was able to take observations.

The journey down river was a most delightful one, and our rapid voyage down to Lokoja was only broken by a stoppage at Moragi, where the governor received the Emir of Lafiagi. He went up the river again from here to Bajibo, to receive an answer from the French officer commanding the expedition which had entered Bussa, and of which he received the first intimation on the road to Ilorin by a messenger from the king of Bussa himself.

Quite an exciting experience was jumping the sandbanks, and the stern-wheeler I was on, called the *Empire*, proved so good at this that it soon distanced the remainder of the fleet, who one after another ran aground, and were lying inert like crocodiles on the treacherous banks of sand, having to drag themselves off by an iron cable. On the 24th we passed Egga, an important station of the Company's, and quite a fine-looking place, with rows of warehouses covered with corrugated iron, and reached Lokoja on the 25th, where there was naturally great excitement at the return of the troops.

People here had had little news of what was going on, and a report at one time that the expedition had been cut up before Bida, and the Nupes were advancing south on Lokoja, caused a general exodus from the town. During the following few days before leaving, Major Cunningham and I went down river in a canoe, and, pitching our tents on the river-bank, did our best to secure some West African antelope without success. We saw a few hartebeest, kobus kob, and wart hog, and the sable antelope and small gazelle exist also. It is difficult for me to give any account of the game in the country, as the expedition was much too large, and conducted in too hostile a country to allow of leaving the column for any distance.

On the high ground above Jebba there are plenty of hartebeest, and on the approach of our advanced party at the first camp from there, an officer saw a lion making off, angry at being disturbed from his resting-place. North of Bida there are also lions. It was on our way down river that we heard of the sad news of the massacre at Benin. The Patanis, a tribe living in the Niger delta only about 80 miles from Benin, whom we went against with a small expedition, were wise in

their generation, and rendered hostages for their good behaviour; so the attack did not take place, and, steaming on rapidly, it seemed like a dream to find one's self again on the mail steamer, which was luckily waiting for us at Forcados. Thanks to the wonderful organization and the success of the operations, we were able to return to England much sooner than had been expected.

It was a great pleasure, on my way home, to receive the news of the honour which had been awarded to me by this Society, which is not only a great encouragement, but recompenses one for the discomforts and hardships unavoidable in African travel.

Before the reading of the paper, the PRESIDENT said: It seems only yesterday that Lieut. Vandeleur read to us his account of the work he had done on the eastern side of Africa—I believe it was the day before he went down to Windsor to receive the reward of his services from Her Majesty the Queen. He has given himself no rest, and since that time—a very short interval—he has been doing admirable work on the western side of Africa, and, judging from his former paper, I think we may promise ourselves a most interesting evening. I will now ask Lieut. Vandeleur to read his paper.

After the reading of the paper, the following discussion took place:—

The PRESIDENT: Sir George Goldie, under whose command Lieut. Vandeleur had the honour to serve when he did this excellent geographical work, will commence the discussion of the paper.

Sir GEORGE GOLDIE: I have one fault to find with Lieut. Vandeleur's paper, namely, that he has not told you enough about himself. I may hope that, as he grows older, he will become cured of that failing. We have heard in this hall a great number of African travellers at various times, but I doubt if any can surpass Mr. Vandeleur in the all-important points of accuracy of astronomical observations and careful mapping, under circumstances so trying as those in which he found himself. In ordinary African travel you can make your camp as spacious as you please, and if troubled with the tumult inside you can go outside, but you cannot do that when making war against vastly superior numbers. Our little zareba used to be crowded every night with 30 Europeans, as many horses, 500 troops, 1000 carriers, and a host of camp-followers, and of course a mass of provisions, war material, and equipment, and I used to admire the calm imperturbability of Mr. Vandeleur in the midst of this, doing his geographical work at such moments as he could be spared from his more important military work.

Then there is another point. You may have gathered from his paper that the health conditions were not exactly of the best kind, notwithstanding the immense precautions which I may say the company took for the comfort of the officers, and the careful and constant attention which Major Arnold, excellent soldier that he is, gave to this matter, but with bad water and exposure to the equatorial sun the health was not good. I may tell you, from the day we started from Lokoja to the day we came back we had with us altogether less than forty Europeans, yet our medical staff had to attend to no less than thirty cases of fever and dysentery, and out of these thirty patients eight were invalided as unfit to proceed further. But then Mr. Vandeleur, though you would not think it to look at him, is an old and hardened African, and I never saw him disabled for one moment from taking his sights through his sextant or his equally important sights over the barrel of his maxim gun.

Now, Mr. Vandeleur has, I think, given us in his paper and maps—excellent maps—all that there is to be said as to the direct geographical results of our operations; but if you wish me to say any more, I can briefly indicate to you certain indirect geographical benefits, which I think may be reasonably expected. The first of these is the greater security for explorers in these vast Sudan regions. I don't mean to assert for a moment that the Mohammedan potentates of the Sudan have habitually inflicted or promoted violence to white travellers, although many instances to the contrary might be quoted; but if they welcome the coming guest, they have almost invariably failed to speed the parting guest. The whole history of Sudan travel is full of records of long detentions at the various centres. I need hardly point out to you how these detentions exhaust the health and energies of the traveller, to say nothing of his resources. I will give you one instance to show why I think travelling in the Central Sudan will be more expeditious in future. Before I left this last time, I received a letter from the Emir of the powerful state of Zaria, in which he said he had sent criers round all his principal towns—for you must understand, in the Central Sudan they still maintain the system of criers, which is dying out in this country—instructing his people in future to allow white men and everybody connected with them to pass through the country rapidly and quietly. Now, I have dealt with one point of great advantage to geographical research, as a result of our operations; and here is another point—that is, the diffusion of very much needed geographical knowledge in this country about these regions. I am, of course, not alluding to the Royal Geographical Society—they know all about it, but I have noticed a great tendency in the mind of the general public to confuse Benin with Bida. Now, Mr. Vandeleur has told us that the distance from Benin to Bida is the same as that from London to Paris, only with no railway communication. I venture to point out that the gulf between cannot be measured by distance, because, as you know, Benin belongs to the barbarous pagan states which line the Gulf of Guinea, and which have little or no communication between each other; whereas Bida, or rather Nupe, of which Bida is the capital, is a province of that vast Sudan region which runs south of the Sahara, and stretches 3000 miles across Africa, from the frontiers of Abyssinia on the east to the frontiers of French Senegal on the west, a region which has considerable unity for two reasons: firstly, because of unity of metaphysical belief; and, secondly, because of the unity produced by the communications kept up by Hausa caravans continually passing among them, so that the British guns fired at Bida last January have before now reverberated at Khartum, and when the British cannon fire at Khartum their echo will reach to Sokoto. There was a third result of our operations—I think I stated I would mention three—which does not appear at first sight strictly geographical, that is, supposing geography is concerned only with the inert surface of our globe; but I think of later years we have taken a wider view, and recognized that our science is concerned as well with the vegetable and animal life on that globe, and that, of all the species of animals inhabiting the earth, perhaps not the least interesting is that known as man. Now, if we once admit that sociology comes within the sphere of geography, we must admit that the extraordinary phenomenon of universal slave-raiding going on in these regions, and therefore the means for their suppression, are matters fairly to be discussed in this hall—but, indeed, they have already been discussed here. About a year ago, just after I had returned from the Niger, I heard read here two deeply interesting papers on these regions in the same evening, one by a distinguished Fellow of this Society, Mr. William Wallace, C.M.G., who I venture to say is one of the most remarkable men, and one of the most modest men, and therefore one of the least-known men, who during the last twenty years has contributed to the

opening up of the dark continent to European civilization. I should like to say, that Mr. Wallace is here to-night. I wish you could hear him speak presently; but I may tell you, from twenty years' knowledge of him, I am perfectly confident you will not have that pleasure. The other paper to which I referred was by the Rev. Charles Robinson, mentioned by Mr. Vandeleur, who has just returned from Hausaland. In that paper, as in his book, Mr. Robinson painted most vividly the horrors and miseries attendant on slave-raiding in the Central Sudan, and being a most humane man, and feeling and thinking as he did that the burden of crushing so vast an evil ought not to be allotted to the slender resources of a chartered company, he made a strong appeal, or rather he urged a strong appeal should be made, to the Imperial treasury, that out of its vast resources it would crush this gigantic evil. After the paper was read, our President called upon me to speak, and I ventured, while concurring with Mr. Robinson, to point out that, inasmuch as the Imperial treasury had never contributed one shilling towards the creation or development of that vast British sphere, I was not very sanguine they would spend the millions necessary for dealing with this matter under our expensive imperial system. I said then the only alternative was for the Niger Company to follow the policy it had followed since its foundation—a policy successful in crushing slave-raiding south of the Benue; a policy of driving a nail where it would go, of taking a step forward wherever possible, and not attempting to take a step where the obstacles appeared for the time too strong. I was not able to tell you then that a very large step had at that time been decided on, and active preparations were being made to carry that step into effect. You know now from the press what has been done; but I ought to tell you that the work which has been done, although very important, is only part of the whole that remains to be done in that region. Whether the Company will survive to see the conclusion of that work is a matter about which I don't venture to express an opinion; but I think I may prophesy this—whether it survives, as I originally hoped, for another ten years, or whether it expires, as the French papers say it will, within the next ten weeks, whoever takes its place will be compelled to pursue its policy, and in due course of time to enable the industrious and intelligent populations of that vast region to live under a reasonable system of security and liberty.

Major CUNNINGHAM: I feel, after what Sir George Goldie has said and the lecturer has told us, that I cannot tell you anything at all from a geographical point of view. I will only give you a few words from a military point of view, if I may do so at what is, strictly speaking, a geographical meeting. When we arrived at Lokoja at the beginning of January, we found the force already assembled; twenty English officers, most of them quite new to their men. In the English army great stress is laid on sympathy between officers and men, and we rely a great deal on the men knowing their officers. At first sight it seemed a little bit doubtful how it would go, as the officers were mostly strangers; there was only one thing to make up for this—the excellence of the officers, and nothing could have been better than those we had. There is one other point without which things might have gone very differently, and that was the excellence of the preparations and organization, the equipment, the material, and everything, and for that I cannot say how deeply we are indebted to Sir George Goldie and his staff. It was a campaign conducted on a scale usually followed by governments, and really it is wonderful; it makes one feel proud of the British Empire to think a company can do what is usually done by a government. I have had the pleasure of serving more than once with Mr. Vandeleur, and can thoroughly endorse what has been said about his accuracy and work, and the difficulties under which he has had to make his observations. The same thing occurred in other expeditions when I was with him, and I have no doubt he will be equally accurate in the future.

The PRESIDENT: We had the great pleasure of listening to a paper by Mr. Wallace last May, but I fear, from what I hear, that we are debarred from the pleasure of hearing him this evening. I am sure we must all congratulate the naval commander of the Niger expedition for the admirable way in which he brought his vessels to the points where they were wanted, and therefore we accord him our warmest congratulations on his return safely home. I fear that is all we can hope from Mr. Wallace, if he is not inclined to address us. I must, therefore, turn to what was said by Lieut. Vandeleur and Sir George Goldie on the immeasurable gap between Bida and Benin. I cannot help hoping that Major Gallwey, in spite of that vast distance, will kindly give us some account of Benin, especially as he has been so good as to exhibit most interesting and valuable objects, brought by him from Benin, in the next room; on that ground I venture to call upon Major Gallwey.

Major GALLWEY: I did not expect to be put on my feet after a paper about Bida. I have heard the paper with great interest, because, while the Bida campaign was going on, in the Niger Coast Protectorate, in another part of the world not very far off, but further than London from Paris, we were engaged in carrying out the punishment of the king of Benin and his people. I am afraid the geographical knowledge that we gained during the expedition was very small compared to that attained by the surveys of Mr. Vandeleur. At present the Benin country is being surveyed by Captain Carter, Captain Roupell, and Mr. Turner. I hope, therefore, that before many months are over, we shall have astronomical observations to help the Society to put Benin city and neighbourhood on the map.

Of course there has been a great deal of criticism about the late Mr. Phillips and his pacific mission to Benin city. I feel sure that if that officer were alive, he would answer any question that might be put to him satisfactorily; and it is satisfactory to know that, although when we came to the city the king cleared out, we have now got the chiefs and the fetish priests, and it only remains for the king to come in. It is also satisfactory to know that an end has been put to what was probably the cruelest rule in existence. I am sorry I am unexpectedly called upon to speak, but I can add my word of thanks to Mr. Vandeleur for the interesting paper he has read this evening.

The PRESIDENT: I think this Society may congratulate itself and feel proud of the work which has been done by one of its Vice-Presidents. We are delighted to see, on a second occasion in a very short time, our colleague, Sir George Goldie, returned from the Niger region. It is, I think, quite fascinating to think of the admirable way in which his expedition was conducted, of the foresight of its organization, and of the military skill with which success was secured, and Sir George Goldie has just explained to us the value of the expedition from a geographical point of view. It must be a great pleasure to all the officers, and especially to our friend here, the lecturer this evening, to have served under such a chief as Sir George Goldie. Mr. Vandeleur has shown himself to be a most zealous geographer, for it is no easy work to carry on, during arduous military service, a complete series of astronomical observations, requiring much watching at night, much forethought, besides the skill which he has acquired in the use of instruments and in the computation of his observations, and I am sure we must all congratulate Mr. Coles on the great success which has been achieved by one of his pupils. It is now our pleasant duty to pass a vote of thanks, and I am sure it will be carried by acclamation, to Lieut. Vandeleur for the interesting paper he has read to us this evening, and for the work he has done for us in Africa, in completing these surveys, of which we shall have the use, and also for the interesting sketches on the screen which he has shown to us. I may add that we have to thank some other gentlemen as well as Lieut. Vandeleur for the splendid exhibition

you will be able to inspect after the meeting, in the next room. I am sure I may convey to Lieut. Vandeleur the thanks of the meeting.

NOTE.—The accompanying map and plans have been reduced from Lieut. Vandeleur's original drawing, with some additions from documents of the Royal Niger Company.

AN ANGLO-AUSTRALASIAN ANTARCTIC CONFERENCE.

ADVANTAGE was taken by the Council of the Society of the presence in London of the premiers of the Australian colonies in connection with the Queen's Diamond Jubilee, to arrange for a conference on the subject of the renewal of antarctic exploration. All the premiers and agents-general, including those of Cape Colony, were invited to a conference on Monday, July 5, in the Council-room of the Society. The invitation was accepted by the Right Hon. G. H. Reid, Premier of New South Wales; the Right Hon. Sir Hugh Nelson, Premier of Queensland; the Right Hon. Sir Edward Braddon, Premier of Tasmania; Sir Andrew Clarke, Agent-General for Victoria; Sir Saul Samuel, Agent-General for New South Wales; the Hon W. T. Reeves, Agent-General for New Zealand. Unfortunately, at the last moment the premiers found it impossible to be present, and the colonies were represented by Sir Saul Samuel, Sir Andrew Clarke, and the Hon. Charles Bowen (New Zealand). The President, Sir Clements R. Markham, occupied the chair, and among those present were the Duke of Argyll, the Marquis of Lothian (President of the Royal Scottish Geographical Society), Sir Joseph Hooker, Admiral Sir George Nares, Admiral Sir Erasmus Ommanney, Prof. Rücker, F.R.S., Mr. Yardley, besides the following Members of Council: General Sir Richard Strachey, Admiral Sir W. J. L. Wharton, Sir John Kirk, Sir Charles W. Wilson, Sir George Taubman Goldie, Admiral the Hon. W. J. Ward, Admiral A. H. Markham, Sir Henry Thuillier, Sir George S. Robertson, Colonel Farquharson, Hon. G. C. Brodrick, Colonel G. E. Church, Major L. Darwin, Mr. J. F. Hughes, Mr. A. P. Maudslay, Mr. W. M. Beaufort, Mr. E. L. S. Cocks, and Mr. Cuthbert E. Peek.

The PRESIDENT opened the proceedings with the following address on the Importance of Promoting Antarctic Exploration:—

We, the President and Council of the Royal Geographical Society, have invited to confer with us on the subject of Antarctic Exploration, the premiers of Australasia, who are now in England, and the premiers of New South Wales, Tasmania, Queensland, and the agents-general of New South Wales, Victoria, and New Zealand have accepted our invitation. I am glad also to say that the Hon. Charles Bowen, member of the Legislative Council of New Zealand, is also present. I would mention to our Australian guests who are present, that they meet here

the Vice-Presidents and Council of the Royal Geographical Society; His Grace the Duke of Argyll; the Marquis of Lothian, representative of the Council of the Royal Scottish Geographical Society; Sir Joseph Hooker, the greatest living antarctic authority; Prof Rücker, our greatest authority on terrestrial magnetism; Sir George Nares, one of the two admirals living who have crossed the antarctic circle (Admiral Maclear is the other); and Sir Erasmus Ommanney, who took so strong a part ten years ago in bringing forward this question. The urgency and importance of renewing antarctic exploration is, however, strongly felt throughout the civilized world, and scientific societies in this country are unanimous on the subject. For several years its importance has also occupied the attention of scientific men in the Australasian colonies; the subject has been brought to the notice of the Colonial governments, I believe, on several occasions since 1888, and in that year the Government of Victoria certainly expressed its willingness to take action, if the expedition received similar support from the mother country, and in that year there was a correspondence with the Treasury on the subject.

The time has now come for making a sustained effort to obtain funds for the despatch of an antarctic expedition under the joint auspices of the mother country and the colonies. But before entering upon the main question, I cannot refrain from referring to the geographical record of the colonies, and the part taken in that record by this Society. There is no finer passage in the history of discovery than that embodying the achievements of Australasian explorers. By indomitable pluck and perseverance, by the exercise of all the high qualities which combine to form the most perfect type of a geographical explorer, the vast deserts were traversed from end to end and the discovery of Australia was completed. This Society had some share in promoting the great work of Australian discovery by grants of money—especially on the occasion of the Leichhardt search expedition, and by the bestowal of the Royal gold medal on Australian explorers, and fourteen minor awards on eleven different occasions. Altogether we have conferred awards on twenty-five Australian explorers. In fact, the Royal Geographical Society has for sixty-seven years worked hand-in-hand with the colonies in furthering explorations. It has done so by effectual representations to the home Government in the early days of the colonies, by giving its cordial and active sympathy, by material help, and by conferring its honorary awards. These are our title-deeds for the right of appealing to the colonies now.

The first duty of the colonies was to explore their own territories, and have their coasts surveyed—very arduous and difficult surveys, extending necessarily over many years; but when that work is at length achieved, their clear duty is to take their share in the discovery and exploration of the unknown regions near to but beyond

their own limits, first and principally for their own benefit—which is a very great one—but also as taking a place among the civilized nations of the earth in a way worthy of their traditions and their parentage. In this country we feel that a great duty is neglected while the antarctic regions are unknown. This is the piece of work which faces us, which has got to be done, and which cannot be turned away from without discredit and shame. We feel that antarctic exploration is equally incumbent on our colonies in the southern hemisphere. It is at their doors, at the doors of those great communities which inherit the traditions of Britons.

For the first time, there is now work to be done in which the mother country and the colonies can and ought to co-operate and labour actively together. It is hardly necessary to point out how much good so much co-operation and community of interest in a great and heroic expedition is calculated to do; how the tendency will be to knit more closely the ties which connect us, to strengthen our sympathies, and to make us realize more forcibly perhaps, than in any other way, that we are one people with the same interests and aspirations.

I will now lay before our guests the present aspects and conditions of the antarctic question. Both the Royal Society and the Council of this Society have appointed committees to consider the results to be obtained by an antarctic expedition, and its requirements. The committees have made their reports, that of the Royal Society dwelling mainly on the urgency of a magnetic survey, and that of this Society enumerating the other valuable results of such an expedition, discussing the character of the difficulties to be encountered and the equipment required.

The subject was then brought to the notice of the Admiralty, and the reply of their lordships is dated April 1 of this year. While their Lordships regret that they are unable to take any direct part in organizing an expedition, at the same time they regard the enterprise as one of importance in the interests of science, and one the results of which they will watch with great interest. The Lords of the Admiralty are further prepared to aid in the outfit of the expedition to an exceedingly moderate extent. But we feel confident that this letter is not the last word, and that material assistance will eventually be given, both as regards the loan of officers and the grant of supplies, especially, and almost, I think, certainly, if the colonies resolve to co-operate with us. I may mention that when the resolution was brought forward at the British Association in favour of an antarctic expedition, the present Prime Minister, the Marquis of Salisbury, was on that occasion in the chair, and he put that resolution, which was carried unanimously. I consider that point gives us considerable hope if we should resolve to bring the matter before the Government, and we certainly shall do so if we are encouraged by the co-operation of the colonies.

The reply of the Admiralty made it incumbent on this Society to endeavour to see how they could raise funds for the equipment of the expedition, and the Council took this question into serious consideration. We believe £50,000 will provide for the purchase of a ship, for stores and provisions, and the pay of men for one year; but a proper expedition should have two ships, and its work is well cut out for three years. We are confident that half the sum I have mentioned can be found in this country; and we believe that, if this is the case, the other half will be provided by grants voted by the Colonial legislatures. We are aware that there must be numerous demands on the Colonial revenues, and that they are limited. But, on the other hand, the advantages far outweigh all such considerations, whether the material advantages of an antarctic expedition are passed in review, or full weight is given to the credit of such an undertaking, or the wisdom of cementing the friendly relations between the mother country and the colonies by common action in a great and good cause, has its influence in the decision. It is well understood now that all scientific knowledge leads directly or indirectly to practical and useful results, and its acquisition is therefore the legitimate work of every government. We earnestly hope that these reasons will guide the deliberations of our fellow-countrymen in the colonies, and, in conclusion, I would ask that this message may be conveyed to them.

Our Society has shown in many ways in times past deep sympathy with the noblest aspirations of our fellow-countrymen in Australasia. This Society is insignificant as compared with any one of the colonies, and we only compare very small things with great in speaking of ourselves, but we are in earnest in this matter. We have numerous calls on our revenues, and they are very limited, yet so convinced are we of the direction in which duty points, that we are prepared to make great sacrifices. I am authorized by the Council to say that up to £5000 we will vote any sum any of the colonies may vote. I can say no more than this to convince our guests we are in earnest, and that, after careful, thoughtful, and mature consideration, we are impressed with the necessity of the renewal of antarctic exploration. Those better able to state the case briefly and clearly are in this room, and will put before you the results of an expedition. We shall then have stated our case, which is a strong one—utility, policy, patriotism, all plead for it—and I leave it with some confidence in the hands of the premiers of the colonies in the southern hemisphere. I will now ask His Grace the Duke of Argyll to state to you his opinion on the value of some of the results to be derived from antarctic exploration.

The Duke of Argyll: I hope it will be understood by this meeting that I do not appear here as representing any particular branch of science. My life has been largely passed in pursuits much less agreeable. At the same time, for more than half a century I have had a

deep interest in many branches of the physical sciences, and especially in geology, and I have been President of the Scottish Geographical Society; in one respect, too, I can feel that I am a fit member of this meeting, because for several years it has been to me more and more an earnest desire that the antarctic regions should be thoroughly explored, because of the important questions upon which light must be thrown by that exploration. In the first place, there is one general consideration which has long struck me. It seems to me almost a reproach to civilization and to scientific men that we have arrived at the close of the nineteenth century of the Christian era without knowing the whole superficial appearance of this little planet on which we live. We have come to an age when, by the advancement of the physical sciences, and by the most wonderful discovery that has ever been made—I mean the analysis of light—we are actually able to analyze the substance and distinguish the chemical composition of the most distant objects in space. We can do it almost as correctly as a chemist will analyze a meteorite or an aerolite in his laboratory. This is an astounding result of science, and it does seem a strange contrast, compared with the analysis of the most distant regions in space, that we should not know the whole of this earthly home on which we live. It is only the other day, in the lifetime of most of the gentlemen I see here present, the great majority of whose hair, like mine, is tinged with grey, that we have come to know anything of the interior of one of the great quarters of our globe, viz. the great continent of Africa. Passing from that general consideration, I would like to indicate one or two points connected with geology upon which light might be thrown, I think, by a thorough exploration of the antarctic continent. It was only the other day that, in conversation with my noble friend, Lord Kelvin —who stands *facile princeps* at the head of men of science in all those departments of physics in which mathematics are brought to bear—he said to me that he thought the most interesting question now to be solved was the antiquity of the oceans, of course including in that the antiquity of its continents, *i.e.* the great land-masses which have been separated on the oceanic surface by some geological operation. Our continents are nothing but large islands surrounded by the sea. Then, of course, the depths and characters of the oceanic spaces are one of the great questions, not only of geography, but of geology. I should like immensely to know—and it would throw a great light on these questions—whether there are any fossiliferous rocks in the antarctic.

We have learned, I think, with astonishment, in a way completely puzzling to our theories as to the decreasing heat of the globe, and its capability of supporting animal and vegetable life, that there are rocks towards the north pole, with fossiliferous beds showing a rich and varied vegetation, thus proving that it was possible to sustain life in those latitudes at some period of the world's history. This is rather

a puzzle to geologists and physicists, and it seems to me that the rocks discovered in Greenland, full of rich fossil vegetation, indicate a close connection between that country and the land we ourselves dwell upon. It is only about thirty-five years ago that, rather by accident than good guiding, I was fortunate enough to discover a small piece of fossiliferous rock in the island of Mull, that contained the most beautifully preserved fossil leaves, which can now be seen in the British Museum. The discovery of that small piece of fossiliferous rock gave the key to the geological age of all the trap rocks of the Hebrides, the Shetland islands, and Greenland. Now, it would be of immense interest if we could discover also in the antarctic continent any fossiliferous beds showing the nature of the vegetation that may once have existed there. It is most probable that when the north pole was of so temperate a character as to bear vegetation of a kind comparable to that now flourishing in Japan, the antarctic lands too were capable of sustaining such life. That would be a very valuable indication as to the conditions under which that vast hollow has been formed in which the almost limitless pacific ocean lies.

There is another point I should like to see more or less decided by the exploration of the antarctic continent, and that is the question which is just now exercising geologists almost more than any other, viz. the effects of what we know as the glacial age. You know, no doubt, that since '41, since the arrival of the great Agassiz in this country, who introduced to the cognizance of British geologists the action of ice in the form of glaciers, the glacial theory has been growing, growing, growing, becoming more fixed in the imagination of the geologists, and giving rise to the theory that all our existing surfaces north of the latitude in which we are now standing, were mainly moulded by a great ice-sheet—not icebergs, not even glaciers in the ordinary sense of the word, but an enormous mass of ice 2000 or 3000 feet thick, which may, though no one knows how, account for the deposit of the superficial gravels and boulders. For myself, I never believed in that theory. I don't believe that an ice-sheet of that kind existed, but if there is any part of the globe where existing facts will throw light on the subject, it is the antarctic continent. I remember I was much struck many years ago, in reading the account of Sir Joseph Hooker's voyage, in the *Erebus and Terror*, in the antarctic, to find that, whereas the icebergs in the north are almost invariably jagged and peaked in their forms, and excessively irregular, almost all the icebergs in the antarctic ocean were perfectly horizontal, vast table-lands of ice floating in the ocean. We all know how it is that the icebergs in the north assume that form; they are born, or "calved," by falling masses from ice-sheets—glaciers, in short—which flow into the sea from the vast continent of Greenland. It appears to me that the flat tops of the antarctic icebergs indicate conditions under which no such

disruptive movements take place as account for the form of the northern bergs. We may probably have there a very considerable continent covered with a true ice-sheet, and the question is, What is the cause of motion? Does it move horizontally without any thrust from high mountains; or is it formed gradually by the excess of falling snow over the powers of melting, until at last the power of flotation lifts it up, and carries it along the ocean? All these are questions on which the exploration would throw the greatest light. It would reflect also on many problems at our own doors, and I cannot adequately express the interest I feel in this matter. With regard to the appeal made to our fellow-citizens and fellow-subjects and countrymen in another part of the globe, I have no doubt of its success. We need not appeal to the colonists on merely utilitarian grounds. It is acknowledged that the very soul of science lies in the divine curiosity which makes us seek the explanation of all the phenomena of the globe. I have no doubt whatever that when they see exertion made in this country, they will think it due to their own reputation and credit to give us their hearty co-operation and help.

The PRESIDENT: After what His Grace has said, I think no one in this room has any further doubt as to the interest which attaches to the exploration of the antarctic region, but I am sure this meeting will like to hear a few words from our old Vice-President, Sir Joseph Hooker, who accompanied that famous expedition under Sir James Ross. I believe he is now the sole survivor.

Sir JOSEPH HOOKER: I feel it to be a great privilege to be allowed to address this meeting, both because I have myself visited three of the colonies of which there are here present the representatives, and because of my having, in my connection with Kew, so long co-operated with the Australian colonies in their endeavour to add to their vegetable resources.

Interested as I naturally am in antarctic exploration, it has always appeared to me remarkable that never since Ross's great discoveries, now sixty years ago, have the scientific societies of Australia, of most of which I have the honour of being a Fellow, made a serious joint effort to send a vessel, on however limited a scale, to explore that vast region extending all round the globe for nearly 1500 miles from the south pole, which lies as it were at their feet, and which has hitherto been penetrated to any distance beyond the antarctic circle on two meridians only.

To the eloquent tribute paid to science by the Duke of Argyll, and his lucid statement of the results to be obtained by an expedition to what he has rightly indicated as by far the largest hitherto unexplored area on the surface of the Earth, I have nothing to add. If, however, I were asked what I think would prove to be the most prolific subject, in a scientific point of view, to be investigated by such an expedition, I would instance hydrography, including the natural history of the sea-bottom, geology, meteorology, and, above all, magnetism; but there is, further, a vast field for discovery in all departments of zoology and

botany, and I would conclude by expressing my passionate interest in the objects that have called us here together, and my ardent hope that antarctic exploration will be pursued by the Australian colonies with zeal and efficiency.

The PRESIDENT: I would now ask Prof. Rücker, a prominent member of the Royal Society, to address to the meeting a few remarks on the subject of the results from an antarctic expedition with regard to terrestrial magnetism.

Prof. RÜCKER: I don't think it will take more than a few minutes to place you in possession of the main facts which lead magneticians to desire that this expedition should be despatched, as at present we are in a very early stage of knowledge with regard to terrestrial magnetism—in the same state in which astronomy was before Kepler and Newton. We are getting together a number of facts, but have not yet found the thread which binds them together. It is necessary that observations should be taken in every part of the globe, and especially around two or three points of interest in the far north and south respectively. Such observations are of importance, as it is just possible that by means of them we may arrive, in respect of terrestrial magnetism, at the stage which astronomy has now reached, and be able to predict, for many years to come, in what direction the magnet will be pointing at any given time and place. At present, in the more civilized portion of the world, we can do this for a few years. I have drawn out a table of the change of declinations for the English channel, which has proved very accurate for a range of ten years; but in the southern regions such calculations may be many degrees out, as we have very little knowledge of the direction in which the magnet points. The map serves to illustrate this. There are three points of land which enter the southern region—America, the Cape, and Australia; two of these belong to the British Empire. At all these three points the direction of the magnet is changing very slightly indeed; during the last thirty years it has changed but half a degree at the Cape, and at Melbourne, and also to a very small amount in South America. But, curiously enough, in the intervening seas, we have every reason to believe that a change is going on rapidly, though we have little knowledge as to what it is. It is, therefore, important that these spaces should be mapped, and though no great number of steamers pass from the Cape to Australia in the far south, those that do so may occasionally go a good many miles out of their course because they do not know the magnetic variation.

The position of the south magnetic pole has never yet been accurately determined. Sir James Ross got to about 150 miles from it. But there are other points of considerable magnetic importance, namely, those at which the magnetic force attains a maximum value. There are two such in the northern hemisphere—one in Canada, one in Siberia; but there is some question as to whether there are one or two in the southern

hemisphere. If there are two, they are near together, and probably not far from the magnetic pole. It is important we should know where they are and whether they are moving. Probably, to make sure whether there is any movement going on, we should have to wait for another fifty years, after a new series of observations was made, and that is certainly a good reason for not delaying the beginning of so lengthy an inquiry. It is not a matter of the last importance to get to the magnetic pole, but it is to survey the land round it, both from the practical and the scientific standpoint. Every magnetician in the world hopes that this most interesting magnetic problem will be solved, and I sincerely trust that the Australian colonies will join with England in sending this expedition.

The PRESIDENT: I regret that Dr. John Murray is unable to be here. He has written the following letter:—

"Challenger Office, Edinburgh, July 3, 1897.

"Dear Sir CLEMENTS MARKHAM,

"I very much regret that engagements in Scotland will prevent me from taking part in the Conference on Monday.

"Could I have been present, I should have been able to add little to what I have already said with reference to the advantages, from a scientific point of view, to be derived from a complete exploration of the south polar regions.

"It is much to be regretted that the Government cannot see its way to fit out an antarctic expedition at the present time. Ever since Britain became a great sea power, learned men have been able to induce governments to dispatch a naval exploring expedition about every quarter of a century. That interval has more than elapsed since the *Challenger* expedition, and, for the sake of the navy and our intellectual progress, it may be hoped that the *Challenger* expedition will not be the last of the series.

"It would be a magnificent thing should the Home Government be led to reconsider this matter through some joint action on the part of the colonies: it would be an evidence of high intelligence as well as a marked advance in political development.

"This is a subject which should concern, not only the Australasian colonies, but all the colonies of the Empire. I am a colonial—a Canadain—and I would be much disappointed should Canada not take a part in any colonial movement in the direction here indicated. The main object of such an expedition would be to obtain a fuller knowledge of the globe on which we live, and the acquisition of new knowledge is of great interest to all progressive peoples, whatever may chance to be their geographical position on our planet.

"Yours sincerely,

"JOHN MURRAY."

You have now heard the eloquent address of His Grace the Duke of Argyll; you have heard what Sir Joseph Hooker has said, and you have heard of the importance of the magnetic survey from the lips of Prof. Rücker. I would say to our guests connected with Australasia—and I regret that most of them are only present here in spirit—that this is our case. I now ask those present to address us a few words on their side of the question. Perhaps Sir Saul Samuel will speak.

Sir SAUL SAMUEL (New South Wales): I had no idea when I entered this room, or up to the present moment, that I should be called upon to address any observations to you, as I had fully believed that my own premier, Mr. Reid, would be present; but he doubtless, like most of the colonial premiers now in England, is detained by other pressing engagements. I have taken some interest in this question, but will not pretend to address you from a scientific point of view in any way, as I possess no scientific attainments. We know, as we have heard most learnedly to-day, of the value to science which would attach to an exploration of the antarctic ocean, but there is something more than that to interest the Australian colonies—it abounds in whales, and whaling is a commercial undertaking which can be carried out with great advantage. Many years since it was a great industry, particularly in New South Wales, and we had a large number of ships trading to the antarctic ocean whaling, and bringing back large cargoes of oil. This led to great wealth at the time, but the discovery of mineral oil ultimately destroyed or helped to destroy the industry, and now there is very little whaling, though there is still something going on. Ships are being fitted out in Tasmania and New South Wales with a view to reviving that industry. Seals also abound in these seas, and would form another branch of industry. I cannot say what my Government may be prepared to do in the matter, but I have before urged on them to endeavour to contribute in aid of the movement by this Society, and I don't altogether despair that that will yet be done. I will take an early opportunity of seeing my Premier, Mr. Reid, and talking to him about it. I am sure he is well disposed. I think that if the President and His Grace the Duke of Argyll had a personal interview with him it might have some effect. I thank you for listening to these few remarks.

Sir ANDREW CLARKE (Victoria): I must limit my remarks to calling your attention to the fact that the Government I represent felt great sympathy for this movement some years ago, and made a specific offer of support. I believe that spirit still exists, although perhaps the ability of the Government to assist is not so great now as it was then. Still I think that it would have assistance both from the Government and the community. The sentiment is still alive, and some assistance, according to their means, will be accorded. For myself, I think I can best limit myself to saying that I will take care that this matter is

placed before my Government, and attention called to the various points raised by the speakers to-day. Considering the interest taken in this matter nearly fifty years ago, with reference to magnetic observations, I think you can reckon that a fair amount of sympathy and support will be given by the colony I represent.

The PRESIDENT: We have here a member of the Legislative Council of New Zealand, who, although he cannot speak in an official position, can speak with a large knowledge of the feeling which exists in the Legislature of New Zealand. I will therefore ask the Hon. Charles Bowen to address us.

The Hon. CHARLES BOWEN (New Zealand): I am very sorry that there is not an official representative of New Zealand here to-day. I can only attribute this misfortune to the many engagements of which Sir Saul Samuel has spoken, and I hope that, notwithstanding the absence of the chief official representatives of the colonies, they will go back to the Antipodes with the determination to aid in the enterprise which is proposed by this Society. I have no hesitation in speaking of what I believe to be the interest taken in this subject by the Legislature of New Zealand. I have been for a long time a member of the Legislature of that Colony, and know something of its feeling on this matter, because I tested it not long ago, as an old member of this Society. I believe, if a vote of money for an antarctic expedition was proposed by the Government of New Zealand, it would be carried with acclamation. I must say this too in regard to the Government: the present Premier is unable, owing to previous engagements, to be here to-day; but when a deputation went to the Government only a year ago on this subject, the present Premier expressed his great interest in the matter, and said that he would correspond with the other governments of Australasia, and if they were willing to come forward, he would be very glad to make a proposal to the Legislature to co-operate with them. But he seemed to think it was rather useless for one colony to act alone. Since then, I have not heard that anything particular has been done, but I feel quite confident if, in this Jubilee time, the Premiers of the different colonies could be got together, some step might be agreed to by them to bring the question before their respective legislatures. If a vote were proposed in New Zealand, I am confident it would be carried, from what I have seen of the feeling of the Legislature. I quite concur with all that has been said by His Grace the Duke of Argyll as to the discredit that attaches to all Englishmen, more especially to those who live nearest to the south pole, from the fact that no effort has been made to discover the secrets of that great unknown area. I still hope, and indeed feel sure, that the colonies will be willing to take their fair share in the cost of exploration, if the matter is brought before them. I regret to find that, instead of the Jubilee being a good time to bring premiers together, political and other interests have made it

difficult for them to assemble; but I hope something will come of this meeting.

The PRESIDENT: I think we may feel satisfied as to the interest taken in the antarctic question throughout the Australasian colonies. I think we have heard from the Agents-General of New South Wales and Victoria such words of hope and encouragement as will make us feel that this conference has not been called together in vain, and, still more, we are glad to hear from Mr. Bowen of the feeling that he knows to exist in the Legislature of New Zealand. I therefore feel some confidence that, after the proceedings of this conference have been laid before the Premiers of Australasia, as they will be by the agents-general, a movement will arise among the governments of these colonies which will enable us next year to push the matter to completion. I am not aware of anything more we can say on this occasion. We have had stated to us in the ablest way the results to be derived from an expedition, and we have had stated to us, by our guests from Australasia, the feeling which they have on the subject.

The MARQUIS OF LOTHIAN: Before separating, I should like to ask for a vote of thanks to our President to-day, for if any of us take interest in this matter, it will be largely due to the efforts of Sir Clements Markham. I should, too, like to say one word, which I think would appeal to many people, and that is, that the work of antarctic research should be done by Englishmen. Looking at the map which hangs before me, it strikes me that almost every name in the south has been given by this country. I know that foreign countries are at this moment striving to inaugurate expeditions in order to discover what we ought to try and do ourselves. I should not like to see foreign names upon that hemisphere where all the civilized points are inhabited by our countrymen and belong to this country. Therefore, though I am not urging the work upon you from so high a level as that of science, still I think that our historical record in all parts of the world, which has been begun by Great Britain, should not allow that to fall into the hands of others. We cannot expect to do all, but should be first in the field, and I think I might appeal to some who would not be moved by scientific considerations, to help to keep up the reputation in which we have so large a share. I must ask you again to return a vote of thanks to Sir Clements Markham for so kindly presiding and inviting us here to-day.

AN EXPEDITION TO THE SOURCE OF THE NIGER.*

By Colonel J. K. TROTTER, R.A.

TAKING the interior of Sierra Leone as a whole, and dealing with the part we visited lying north of 9° N. lat., there appears to be a strip of country bounded on the north by Wellia, Saionia, Lakhata, and Buruta, on the west by the Great Skarcies, on the east by Bumban and Karena, and extending on the south-west to the coast, which is perfectly flat, and not more than from 100 to 300 feet above sea-level. The rest of the country is hilly or mountainous, and has an elevation of from 800 to 3000 feet above the sea, the least accidented part being that between the line Kalieri-Dakolofe and the Tintarba valley. South of Yana the Great and Little Skarcies rivers run side by side, at a distance from each other of from 15 to 20 miles, through a perfectly flat country, with no well-defined watershed to separate them.

Of the tribes with which we were brought into contact the principal are the Mendi from the Sherbro country, the Limba from the country north and west of Bumban, the Susu from the Great Skarcies valley and the northern boundary, and the Kuranko. I have already spoken of the last. Of the Limba we saw little. Apparently they do not take service in large numbers at Freetown as the other races do. Traders of that race, however, are found in the interior, and they seem to be fairly intelligent and pushing. They are more warlike than the other tribes.

The Mendi form the bulk of the carriers obtainable at Freetown. They are very low in the scale of civilization, pagans, and very superstitious. They have no morale nor link to bind them together; vanity, pride, and self-esteem are quite strange to them, and in corporate form they are contemptible. As labourers and carriers, however, they are very useful, and individually show great courage and endurance. They will struggle with a heavy load till they drop, and will subsist on a handful of rice a day without complaining.

The Susu are Mussulmans. They are generally employed as servants and hammock-boys, and in positions a little superior to that of labourers. They have plenty of pride and self-esteem. They look down upon the other tribes, and regard it as a dreadful insult to be called a Mendi. They are generally men of good physique, very fond of dress, and, whilst working from day to day with no clothes at all on worth mentioning, will turn out, on reaching a town, in the most gaudy raiments.

All the natives of the West Coast, in spite of their defects, which are very apparent, and which in general are those of a low order of

* Paper read at the Royal Geographical Society, December 7, 1896. Continued from p. 259. Map, p. 348.

civilization, appear to me to be tractable and to be very ready to obey the direction of the Europeans. They have their own little quarrels and jealousies, but when once communications are opened in the interior, I do not believe that the Sierra Leone Government will have any serious difficulty with them. Their best point is their light heartedness, which indeed, I think, is the bright spot of West Africa. It is a country where the worst jokes never fail to be appreciated, and where

KING OF TAMISSO.

(From a photograph by Captain Parsaga, President of the French Commission.)

one is certain of bringing down the house without having any claim to being a wit.

In considering the native question, it is important to bear in mind that the natives of Sierra Leone proper, except for those who have come there from up country to find work, are quite distinct and separate in race, tradition, and language from the natives of the interior. The Sierra Leone people are a people to themselves, and I think it is a matter of regret that some name has not been given to the

Protectorate recently added to British Colonial Empire, to distinguish it from their settlement.

The country of the interior is as yet altogether undeveloped and untried. What its producing power is no one knows. All that is known is that the natives, with the merest scratching of the soil, grow rice, cassava, guinea-corn, cotton, and native tobacco in such quantity as they require. Their method of making a farm is to cut down the bush to a height of about 3 feet, leaving the trunks and roots of the trees untouched. After the vegetation which has been cut becomes

STACKING RICE.
(From a photograph by Captain Passaga, President of the French Commission.)

dry, they set a light to it and let it burn. Cassava plants are then put into the ground, and the earth is heaped over them. Rice is now sown on the top, and the land is left to itself. With this amount of cultivation two crops are produced annually. But the amount of ground cultivated by the natives bears a very small proportion to the total area of the country; it is only an acre or two here and there. The land, however, possesses undoubtedly great natural advantages; it has an unfailing water-supply, a rich soil, and is within easy reach of good markets. What it requires is a system of communications, and the establishment of posts on the highlands of the interior. The winding paths and carrier transport are quite unsuited to commercial purposes, and the experience of our commission has shown that mules are well able to do everything required of them in West Africa. The French

officers rode their mules on all occasions; the animals had no difficulty in surmounting every obstacle and in climbing the most difficult ground, and they finished the commission in better condition than any other living thing in the camp. There is no serious difficulty to overcome in making the roads fit for wheels. This done, and with the railway system in the southern part of the Protectorate, transport would be cheap, and it would be possible to establish posts in the highlands of the interior. The question at the bottom of every undertaking in West Africa is that of health, and the one serious enemy to health, so

THE SOURCE OF THE NIGER.
(From a photograph by Colonel Frederick Cardew, C.M.G., Governor of Sierra Leone.)

far as I know, is malaria. But malaria has been overcome in more than one of our colonies, and in the interior of Sierra Leone, at a height of over 2500 feet, with a good water-supply and a hard dry surface, it is hard to believe that, when stations have been carefully selected and prepared with due regard to sanitary conditions, malaria will continue to be a serious danger.

The exploration of the interior of Sierra Leone dates from the arrival in the country of the present governor. Previous to this, it is true, some good work had been done by Mr. Garrett, Major Kenney, and others; but Colonel Cardew, who is a man of great energy, a good

topographer, and is gifted with a wonderful constitution, has taken the work in hand systematically, and will, if he remains in the country, before long have explored every corner of British territory. Geographers owe him a great deal for having found the solution to many problems which have puzzled them for years. In company with Major Grant, R.E., he has done this year a very remarkable and valuable piece of exploration. Sending up Major Grant to Kruto by a different route to that followed by the commission, he thus obtained a second traverse by another line to this place. After Major Grant had fixed the longitude of Kruto by lunar distances, and had carried the time to Tembi Kunda and back, the governor went to Tembi Kunda, and from there traced the Anglo-Liberian boundary along the meridian of 10° 40′ W. and down the Mano river, the course of which was quite unknown before. In another year or so the interior of Sierra Leone, instead of being an unknown land, will become one of the best-mapped parts of unsurveyed Africa.

I hope others will be able to say something about the work which was done in the way of obtaining longitudes by Captain Hill's method of photography. Mr. Tyler managed the photography alone, and much credit is due to him for what he managed to do under circumstances of some difficulty. An observer, to do work of this kind, should be free from every other duty, at any rate during the days that he is engaged on it. In our case this could not be managed, and Mr. Tyler, after a hard day's work, had to sit up all night with his camera, and to work as usual the next day. The objection to the system of photography which necessitates a camera remaining in position for many hours, that the danger of the instrument shifting must be great, does not appear to be real. The solidly built camera stood very firm, and the operation of taking the photographs appears to be simple enough. Provided that the results are sufficiently accurate, the method appears a very practical way of obtaining absolute longitudes.

Notes on the Climate.

The remarks made here must be regarded more as the result of irregular observations having but a limited value for trustworthiness, and as the experience of individual feelings, than as having any positive scientific importance. The observations of barometer and thermometer were taken at different hours daily; the first observation, which was made about the same hour daily, first thing in the morning (from 5.30 to 6.30 a.m.), and the second when the loads reached the halting-place (in the morning, noon, or evening). The only instruments in our possession were an aneroid barometer, and a maximum and minimum thermometer. The minimum thermometer got out of order from the first, and could not be put right; the maximum was, therefore, read twice daily as an ordinary thermometer. The instruments were carried in a case which was packed inside a tin box. The case was kept covered up as far as possible, but in spite of protection the box got very hot with exposure to the sun, and the recorded temperatures, after a march, cannot be regarded as fair shade temperatures. All the clinical thermometers carried by

the commission, which read up to 110° or 112°, and were carried in boxes, and protected as far as possible, burst between the watershed boundary and the Kaba river. In consequence of the heating of the box in which the thermometer was carried, and the absence of a current of air, an arbitrary reduction has been made from the temperatures actually recorded after a march.

Between Port Lokko and Bumban (December 16 to 25, 1895), the lowest of the early morning readings was 70° (Mapema, 5.15 a.m., December 22), the mean being 72·5°. The highest reading was at Rotata (9 a.m., December 20), 84°, and the lowest at Mapema (12.30 p.m., December 21), 81°. The weather at this stage was not excessively hot, but the atmosphere was moist and heavy, and the climate resembled that of Freetown.

Between Bumban and Kruto the lowest early reading was at Isaia (5 a.m., December 31), 58°, the highest 73·5° (Lengekoro, 5 a.m., December 30), and the mean 68°. The highest day reading was 84° (Kundembaia, December 30, 12.30 p.m.), and the lowest 68° (Isaia, 11.45 a.m., December 31). On this last day the sun was obscured by mist.

The nights on the higher ground north of Bumban were perceptibly cooler than in the first stage, and the air drier and fresher. Between Lengekoro and Kruto there was a heavy dew every morning, and generally a dense mist till the sun was some hours above the horizon. This heavy dew was only experienced at this stage of the journey, but during the months of December and January there was everywhere a considerable condensation.

During the month of January, 1896, from Kruto to Boria, the lowest early reading was 58° (Kulakoia, 7 a.m., January 27), and the highest 75° (Bali, 6 a.m., January 26), the mean being 69°. The highest day reading was 86° (Boria, 12.30 p.m., January 31), and the lowest 67° (Samaindu, 12 noon, January 27).

The weather this month was never oppressively hot; the nights were always cool or cold, and on the top of the mountains the air was fresh and bracing, and a strongish breeze was always blowing (generally *harmattan*), which had the effect of making the skin feel chilly, doubtless from evaporation. The valleys were hot and close, the trees excluding both sun and air. Their bottoms are not swampy in the sense that the expression is understood to bear in the low country, where there is frequently a depth of 3 or 4 feet of stagnant, offensive mud; but they are covered with decaying vegetation, marshy, and no doubt malarious. The difference of temperature from day to day in December, January, and the early part of February is very remarkable. A cold night is succeeded by a close one, and the pleasantest day by a very enervating one. This is probably due to the wind, and from the variation of temperature it is clear that the harmattan, which accompanies the coolest weather, does not blow by any means every day.

In the month of February, 1896, from Boria to Kalieri, the lowest early reading was 58° (camp north of Mount Keme, 6.30 a.m., February 14), and the highest 74° (Boria, 6 a.m., February 2; Boala Karafaia, 6 a.m., February 20; and Kambaia, 6.30 a.m., February 25), and the mean 68°. The highest day reading was 96° (Sanaia, 5.30 p.m., February 25), and the lowest 70° (Kiridugu, 11 a.m., February 7).

The weather in the early part of the month was much the same as in January in the latter part it became hotter, and the sun was more powerful. The nights were generally cool. The harmattan wind, which is prevalent in January and December, disappears this month.

In March, from Kalieri to Yomaia, the lowest early reading was 63° (Kabuya, 6.30 a.m., March 19) and the highest 76° (Bibia, 6.30 a.m., March 16), the mean being 72°. The highest day reading was 95° (Yomaia, 5 p.m., March 28), and the lowest 73° (Kalieri, 10 a.m., March 10). The weather this month was sensibly

hotter, and the marching and climbing were found much more exhausting. The air also felt less dry, and for some time, near Kalieri, there was much cloud. Rain fell on one or two days.

From April 1 to 24, whilst still in high country, the lowest early reading was 70° (Kaba river, 6.30 a.m., April 4), and the highest 80° (Kaba river, 6.30 a.m., April 5), and the mean 76°. The highest day reading was 100° (Lakhata, 3 p.m., April 15), and the lowest 86° (Kaba river, 6 p.m., April 1). The weather continued to get hotter. At times it was cloudy, and a little rain fell at night. Descending to the low country, which has an elevation of not more than 400 feet above the sea, during the period between April 24 and May 5, from Balifilli to Kambia, the lowest early reading was 76° (near Wellia, 6.30 a.m., April 28), and the highest 84° (near Wellia, April 25, 6.30 a.m.), the mean being 79°. The highest day temperature was 89° (Balifilli, 3 p.m., April 24), and the lowest 82° (Kukuna, 3 p.m., May 3). We were now in the coast region, and the climate was again that of Freetown, the air being heavy and close, though the sun was not powerful, the sky being overclouded every day, and heavy rain being imminent.

The rainy season in the interior, as we learned from the French officers who had been stationed in the Western Sudan, begins earlier than on the coast, and the rainfall is less. In March, when in the neighbourhood of Kalieri, the rains appeared to be near, but as we travelled west the sky became clearer.

Rain fell on the following days, mostly in the form of thunderstorms and tornadoes, and generally after sunset.

January 22 and 23, 1896.—Camp, north of Tembi Kunda. Heavy rain at night, short duration.

February 19.—Boala Karafaia. Heavy rain at night.

February 22.—Salamaia. Heavy rain at night.

February 23.—Salamaia. Rain in morning, quantity small.

February 25.—Sanaia. Heavy rain at night.

March 4 and 7.—Camp, north of Kalieri. Heavy rain at night.

March 26.—Camp on 10th parallel. Heavy rain at night.

March 27.—Camp on 10th parallel. Little rain during day; day cloudy.

April 6 and 10.—Camp on Kaba river. Rain at night.

April 16.—Camp, north of Lakhata. Rain in afternoon.

April 17.—Camp, north of Lakhata. Heavy rain at night.

April 23.—Kankuia. Little rain at night.

April 24.—Balifilli. Little rain during day.

April 27.—Camp on Great Skarcies. Heavy rain at night.

April 28.—Camp on Great Skarcies. Very heavy rain in evening and all night.

It appears from the recorded temperatures that the high ground of the interior from 1500 to 2800 feet above the sea is much cooler, at any rate at night, than the coast region. The coolest months of the dry season are December and January. The day temperature in February is higher than in January, and it increases to about the middle of April, when the sun's declination is the same as the latitude.

As regards the comparative healthiness of the interior, without venturing to give a medical opinion, I think there can be little doubt that it is less malarious than the swampy country of the coast, and that there are certain places, notably on the plateau north of Saionia, and on the hills of the eastern boundary, in which Europeans might live with much better prospects of health than on the coast. According to the experience of the French, the posts of the Western Sudan, when first occupied, were found to be unhealthy, but after the stations have been put into order and sanitary measures have been adopted, they become healthy.

The natives of the interior are strong and healthy, and of better physique than

those of the coast. They do not suffer from fever, according to their own account, except during the rains, and then in a mild form. The disease which we found to be prevalent everywhere, in some places so much so that it might be fairly described as epidemic, was bronchitis.

ITINERARY.

Place.	Date of leaving.	Mean height of barometer.	Corresponding altitude.	Thermometer readings (Fahrenheit).	Hours of reading thermometer and barometer.	Distance marched from last halt.	Remarks.
	1895.	Inches.	Feet.	Degrees		Miles.	
Freetown	Dec. 16	30·00*	—	—	—	—	*At sea-level.
Lort Lokko ...	,, 18	29·875	125	—	—		
Makanna	,, 19	29·875	125	—	—	11	
Dofunkuyin ...	,, 20	29·77	220	82	11.30 a.m.	12½	
Rotata	,, 21	29·86	140	84	9.0 a.m.	7½	
Mapema	,, 22	28·88	120	81	12.30 p.m.	13	
				70	5.15 a.m.		
Kalangba	,, 23	29·77	220	83	10.45 a.m.	11½	
				73	5.40 p.m.		
Madina	,, 24	29·85	150	83	11.15 a.m.	10½	
				73	5.30 a.m.		
Bumban	,, 26	29·65	327	83	11.30 a.m.	11½	Halted at Bumban 25th of December.
				73½	7.0 a.m.		
				73	5.30 a.m.		
Kawana	,, 27	29·10	825	78	10.15 a.m.	7½	
				74	5.30 a.m.		
Kamange	,, 28	29·24	700	78	10.35 a.m.	9½	
				66	5.0 a.m.		
Katimbo	,, 29	28·55	1380	67	8.30 a.m.	5½	
		28·45	1450	72·5	5.30 a.m.		
Lengekoro	,, 30	28·425	1500	82	4.40 p.m.	11½	
		28·4	1500	73·5	5.0 a.m.		
Kundembaia ...	,, 31	28·8	1100	84·5	12.30 p.m.	11½	
		28·73	1100	66	5.0 a.m.		
	1896.						
Isaia	Jan. 1	28·75	1100	68	11.45 a.m.	8½	
		28·70	1100	58	5.0 a.m.		
Yerembo	,, 2	28·30	1600	69	11.45 a.m.	10½	
		28·25	1630	68·5	5.0 a.m.		
Alkallia	,, 3	28·60	1360	72	10.15 a.m.	9½	
		28·55	1350	69	5.15 a.m.		
Kilela	,, 4	28·50	1400	74	11.0 a.m.	10½	
Kruto	,, 7	28·725	1200	78·5	9.30 a.m.	9	Halted at Kruto 5th and 6th of January.
		28·75	1150	78	8.0 a.m.		
		28·775	1125	69	8.0 a.m.		
		28·725	1175	68	5.30 a.m.		
Nyedu	,, 8	28·55	1350	78	11.45 a.m.	11½	
		28·55	1350	68	5.20 a.m.		
Sogurella	,, 9	27·95	1940	70	10.15 a.m.	9½	
		27·94	2000	70	5.20 a.m.		
Kurubundo ...	,, 10	28·24	1700	72	9.0 a.m.	5½	
		28·15	1720	70	5.30 a.m.		
Porpor	,, 11	28·125	1800	80	11.0 a.m.	11½	
		28·12	1860	72	5.30 a.m.		
Buria	,, 12	28·45	1400	73·5	9.30 a.m.	7½	
		28·35	1550	71	5.30 a.m.		
Kamindu	,, 13	27·675	2200	74	9.15 a.m.	14	
		27·525	2300	70	5.20 a.m.		
Tembi Kunda ...	,, 19	27·175	2750	78	11.0 a.m.	5½	14th, 15th, 16th, 17th, and 18th of January halted at Tembi Kunda.
		27·05	2850	69·5	6.30 a.m.		
		27·1	2800	70	7.0 a.m.		
Camp I.	,, 21	27·275	2600	72	8.43 a.m.	3½	Halted 20th at Camp I.
		27·23	2675	70	6.30 a.m.		
Camp II.	,, 22	27·35	2520	79	11.0 a.m.	3½	
		27·35	2520	70	6.0 a.m.		
Camp III.	,, 24	27·30	2580	83	12.0 noon	3	Halted 23rd of January at Camp III. Tornado at night, 22nd and 23rd of January.
Bali	,, 26	28·00	1900	76	11.45 a.m	6	Halted 25th at Bali.
		28·05	1850	74	6.0 a.m.		
		28·00	1900	75	6.0 a.m.		
Kulakoia	,, 27	27·825	2080	79	11.45 a.m.	4	
		27·75	2020	58	7.0 a.m.		
Samaindu	,, 29	27·60	2250	67	12.0 noon	3½	Halted 28th of January at Samaindu.
		27·60	2250	67	6.30 a.m.		

Place.	Date of leaving.	Mean height of barometer.	Corresponding altitude.	Thermometer readings (Fahrenheit).	Hours of reading thermometer and barometer.	Distance marched from last halt.	Remarks.
	1896.	Inches.	Feet.	Degrees.		Miles.	
Yaria	Jan. 30	28·00	1900	80	4.0 p.m.	2½	
		28·00	1900	65	6 0 a.m.		
Dandafarra ...	„ 31	27·95	1900	71	9.45 a.m.	2¼	
		27·90	2000	64	6.0 a.m.		
Boria	Feb. 2	27·65	2225	86	12.30 p.m.	4½	Halted 1st of February at Boria.
		27·65	2200	74	6 0 a.m.		
Mussadugu ...	„ 4	27·65	2200	76	11.0 a.m.	4½	Halted 3rd of February at Mussadugu.
		27·625	2250	70	6.30 a.m.		
Kirimandugu ...	„ 6	28·25	1650	75	10.0 a.m.	3	Halted 5th of February at Kirimandugu.
		28·15	1775	64	5.30 a.m.		
		28·225	1675	60	6.30 a.m.		
Konkekoro ...	„ 7	28·25	1650	86	12.0 noon	3	
		28·25	1650	65	6.30 a.m.		
Kiridugu	„ 8	28·25	1650	70	11.0 a.m.	2	
		28·225	1675	62	6.30 a.m.		
Bennikoro	„ 10	28·15	1775	72	12.0 noon	4¼	Halted 9th at Bennikoro
		28·125	1750	61·5	6.30 a.m.		
Farama	„ 12	28·19	1700	80·5	11.30 a.m.	3½	Halted 11th of February at Farama.
		28·225	1675	63	6.30 a.m.		
		28·25	1650	66	6.30 a.m.		
Camp No. IV. ...	„ 14	28·275	1625	79	11.0 a.m.	3	Halted 13th of February at Camp IV.
		28·15	1750	61	6.30 a.m.		
		28·20	1700	58	6.30 a.m.		
Camp No. V. ...	„ 16	28·175	1750	72	10.0 a.m.	2¾	Halted on 15th at Camp V.
		28·20	1700	72	8 0 a.m.		
		28·20	1700	69	6.0 a.m.		
Camp No. VI. at Old Karafaia (destroyed).	„ 17	28·225	1675	75	9.0 a.m.	3½	
		28·175	1725	70	6.0 a.m.		
Moriunia	„ 18	28·30	1600	76	11.0 a.m.	5	
		28·25	1650	70	6.0 a.m.		
Bonbonkoro ...	„ 19	28·20	1700	86	5.0 p.m.	2¼	
		28·20	1700	71	6.0 a.m.		
Boala Karafaia ...	„ 20	28·30	1600	87	12.0 noon	10	Tornado during night of 19th of February.
		28·275	1625	74	6.0 a.m.		
Dakolofe	„ 22	28·45	1450	78	11.0 a.m.	4	Halted 21st at Dakolofe.
		28·40	1500	75	6.0 a.m.		
		28·35	1550	70	6.0 a.m.		
Salamaia	„ 23	28·35	1550	78	10 0 a.m.	5½	Tornadoes on night of 22nd and morning of 23rd of February.
		28·35	1500	71	6.0 a.m.		
Songoia	„ 24	28·40	1500	82	11.30 a.m.	7¼	
		28·30	1600	69	6.30 a.m.		
Kambaia	„ 25	28·225	1675	90	5 0 p.m.	8½	
		28·30	1600	74	6.30 a.m.		
Sanaia	„ 26	28·175	1700	91	5.30 p.m.	8½	
		28·25	1650	71·5	6.30 a.m.		
Berea Futambu ...	„ 27	28·25	1650	81	11.0 a.m.	3	
		28·20	1700	69	7.0 a.m.		
Kalieri	Mar. 3	28·14	1750	83	6.0 p.m.	8¼	Halted at Kalieri 28th and 29th of February and 1st and 2nd of March.
		28·20	1700	72	6.0 a.m.		
		28·20	1700	70	6.30 a.m.		
		28·18	1750	71	6.30 a.m.		
		28 175	1720	72	6.0 a.m.		
		28·25	1675	75	6.0 a.m.		
Camp VII. ...	„ 8	28·325	1575	75	10.0 a.m.	3	Halted 4th, 5th, 6th, 7th of March at Camp VII.
		28·25	1675	73	7.0 a.m.		
Camp VIII. ...	„ 12	28·25	1650	71	7.30 a.m.	¾	Halted 9th, 10th, 11th of March at Camp VIII.
		28·05	1850	84	8.0 p.m.		
Simitia	„ 13	28·25	1650	86	3.0 p.m.	10½	
Camp IX.	„ 17	28·15	1750	75	6.0 a.m.	2½	Halted 14th, 15th, 16th at Camp IX.
		28·15	1750	76	6.30 a.m.		
Camp X.	„ 18	28·00	1900	73	6.30 a.m.	7	
Camp XI.	„ 19	28·20	1700	86	6.0 a.m.	3	
		28·25	1650	63	6.30 a.m.		
Camp XII. ...	„ 20	27·95	1950	95	2.30 p.m.	?	
		28·00	1900	67	6.0 a.m.		
Camp XIII. ...	„ 21	28·10	1800	93	5.0 p.m.		
		28·15	1750	72	6.0 a.m.		
Camp XIV. ...	„ 22	28·35	1550	94	4.0 p.m.	3½	
		28·40	1500	69	6.0 a.m.		
Camp XV.	„ 23	27·90	2000	86	6.0 p.m.	4	
		27·95	1950	68	6.0 a.m.		
Camp XVI. ...	„ 24	28·20	1700	94	5.0 p.m.	4½	
		28·20	1700	72	6.30 a.m.		
Camp XVII. ...	„ 25	28·15	1750	88	11.0 a.m.	3½	
		28·10	1800	74	6.0 a.m.		

Place.	Date of leaving.	Mean height of barometer.	Corresponding altitude.	Thermometer readings (Fahrenheit).	Hours of reading thermometer and barometer.	Distance marched from last halt.	Remarks.
	1896.	Inches.	Feet.	Degrees.		Miles.	
Camp XVIII. ...	Mar. 26	28·20	1700	74	6.30 a.m.	2	
Camp XIX. ...	,, 27	28·10	1800	90	5.0 p.m.	4	Tornado at night.
		28·275	1620	74·5	6.30 a.m.		
Camp XX.	,, 28	28·30	1600	83	4.45 p.m.	5	
		28·30	1600	72·5	6.30 a.m.		
Camp XXI. (near Yomaia).	,, 29	28·45	1450	95	4.0 p.m.	5	
		28·50	1400	71	6.30 a.m.		
Camp XXII. (near Small Skarcies).	Apr. 1	28·35	1550	88	11.0 a.m.	3	Halted 30th and 31st of March at Camp XXII.
		28·275	1625	73	6.0 a.m.		
		28·25	1650	78	6.30 a.m.		
		28·25	1650	75	6.30 a.m.		
Camp XXIII. ...	,, 2	28·40	1500	86	9.0 p.m.	3	
		28·40	1500	74	6.30 a.m.		
Camp XXIV. ...	,, 10	29·20	750	93	5.0 p.m.	3	Halted 3rd, 4th, 5th, 6th, 7th, 8th, and 9th of April at Camp XXIV.
		29·20	750	78	6.30 a.m.		
		29·20	750	70	6.30 a.m.		
		29·275	750	80	6.30 a.m.		
		29·275	750	78	6.30 a.m.		
		29·275	750	77	6.30 a.m.		
		29·275	750	78·5	6.30 a.m.		
		29·275	750	76	6.30 a.m.		
		29·275	750	77	6.30 a.m.		
Camp XXV. ...	,, 11	28·90	900	78	6.30 a.m.	4	
Camp XXVI. ...	,, 12	28·60	1350	77	6.30 a.m.	4½	
Camp XXVII. ...	,, 13	29·00	825	78	6.30 a.m.	4¾	
Camp XXVIII. (Kita-Lolo junction).	,, 15	29·35	650	78·5	6.30 a.m.	5	Halted 14th at Camp XXVIII.
		29·40	600	79	6.0 a.m.		
Camp XXIX. (near Lakhata).	,, 16	29·25	700	100	3.0 p.m.	12	
		29·35	650	79	6.0 a.m.		
Camp XXX. ...	,, 18	28·65	1250	76	6.30 a.m.	1	Halted 17th at Camp XXX.
		28·65	1250	89	11.0 a.m.		
		28·65	1250	76	6.30 a.m.		
Camp XXXI. ...	,, 21	28·30	1600	89	4.30 p.m.	¼	Halted 19th and 20th at Camp XXXI.
		28·325	1575	72	6.30 a.m.		
		28·325	1575	72	6.30 a.m.		
		28·35	1550	74	6.30 a.m.		
Camp XXXII. ...	,, 22	28·65	1250	75	6.30 a.m.	3	
Camp XXXIII. ...	,, 23	27·10	2800	92	3.0 p.m.	7	
		27·10	2800	72	6.0 a.m.		
Kankuia	,, 24	27·50	2400	90	3.0 p.m.	3¼	A little rain during the night of 23rd of April.
		27·575	2300	75	6.30 a.m.		
Camp XXXIV. ...	,, 25	29·35	600	89	3.0 p.m.	4½	A little rain during day of 24th of April.
		29·40	560	77	6.0 a.m.		
Camp XXXV. (banks of Great Skarcies).	,, 29	29·60	360	84	6.30 a.m.	9½	Halted 26th, 27th, and 28th at Camp XXXV.
		29·60	360	81	6.30 a.m.		
		29·55	400	76	6.30 a.m.		Rain during night of 27th, and heavy rain during the whole night of 28th.
Wellia	May 1	29·35	600	81	11.0 a.m.	1	Halted at Wellia 30th of April.
		29·35	600	80	6.30 a.m.		
		29·325	625	82	6.0 a.m.		
Fodea	,, 2	29·475	500	86·5	5.30 p.m.	20	
		29·50	450	81	6.0 a.m.		
Kufuna	,, 3	29·675	300	88	11.0 a.m.	9¾	
		29·60	380	78	6.0 a.m.		
Kukuna	,, 4	29·615	350	82	3.0 p.m.	16	
		29·70	300	76	6.0 a.m.		
Petifu	,, 5	29·75	250	86	5.0 p.m.	24	
Massama	,, 5	Embarked for Freetown.				8	At sea-level barometer read 200 feet. Possibly due to commencement of rainy season.

Before the reading of the paper, the PRESIDENT said: I think I ought to congratulate the Society on the extraordinary enterprise of the members of its Council. It was only two years ago that one of our Vice-Presidents discovered the true sources of the Oxus. This year actually three members of the Council were visiting Spitzbergen, one has just sailed for the mouth of the Niger, and we have the pleasure of welcoming back another member of the Council, who has just

returned from exploring the sources of the Niger. I am sure we shall all listen with great interest to the paper Colonel Trotter is about to read to us.

After the reading of the paper, the following discussion took place :—

Captain HILLS: The experiments made by Colonel Trotter on the method of finding the longitude by photography were extremely interesting, for the reason that it is the first time this has been practically tried in the field. Personally, I have tried a number of experiments at home, and convinced myself that a considerable amount of accuracy can be obtained; but, of course, it is different getting results when working leisurely at home, from getting them by actual practical work in the field. The advantages of the method for field work are, that the actual man who does the work need not know very much about it, and work in the field is comparatively easy, except, of course, as Colonel Trotter says, that it often necessitates staying up all night. In this case, Lieut. Tyler had no actual experience of the work before going out. His sole instruction was obtained in about one hour, and consequently the results are very interesting, as showing what can be done under these circumstances. As regards the accuracy, it seems to be about equal to, or perhaps rather superior to, what can be got from an occultation, with this difference—that you can take these photos any night, whereas the occultation would be limited to a certain number of nights in a year. Even at Greenwich they can only be taken on about twenty nights in the year; so that, for determining longitude, the method of observing the occultation of stars by the moon is not as good a method as the photographic, which depends on photographing the moon and stars near it, and measuring the position on the photographic plate. This is practicable on any night the moon is visible, and has the advantage that you can measure the plates afterwards at leisure with a considerable amount of accuracy. At the same time, it has the disadvantage that the results are not available at the time in the field. I think, perhaps, a method could be devised by which they could be measured approximately in the field, but that is a question to be gone into. Practically, we have confined ourselves to trying what are the best results to be got from Colonel Trotter's plates, so far as they have been measured, and, though they are certainly not so good as the ones taken at home, they seem to show that you can determine the longitude within an error of a mile, or something under a minute of arc, by one single plate, which is, I think, a very satisfactory result. It is better than any other method that could be used, unless, of course, you could carry an accurate triangulation; but, next to that, it seems the best method. It is somewhat unfortunate that no attempt was made to take more than one photograph at each station. Of course, what one really wants is a good number taken at one particular spot, but still there is sufficient comparison to get accuracy. It seems to be a good practical method of getting absolute longitudes.

The PRESIDENT: Colonel Trotter has certainly given us a very interesting account of the country he has surveyed, forming a water-parting between the rivers of the coast and the Niger. He has, as it were, completed the story of that great river, which has occupied and puzzled geographers for several thousand years, since the days when the Nasamones, mentioned by Herodotus, made that remarkable journey over the deserts of Africa, and correctly ascertained the direction in which the Niger flowed. If they had lived a little later, they would have won the Gold Medal of the Royal Geographical Society, but, having lived three thousand years ago, they could not be rewarded in that way. They gave a perfectly correct idea, which was accepted down to the time of Ptolemy; but, as far as I can make out, the Arab geographers put us wrong, turning the Niger into the Atlantic, where it remained on the maps till the time of Queen Anne. I think Delisle, the predecessor of D'Anville, was the first man who ceased to make

the great river flow directly into the Atlantic. D'Anville and Rennell got the direction of the river right, and in 1830, Lander, our first Gold Medallist, discovered its mouth. We have now listened to a very charming and interesting account of the country where its sources are met with. I am sure you will all wish me to return Colonel Trotter our hearty thanks for his excellent paper, and for the interesting photographs, which we regret are so few, he has shown us this evening.

LIST OF PLACES ASTRONOMICALLY FIXED.

Name.	Lat. (N.)	Remarks.	Long (W.).	Remarks.
	° ′ ″		° ′ ″	
Makanna ...	8 47 55	Single meridian altitude, allowing for error of parallax		
Mapema ...	8 58 15	Ditto		
Kalangba ...	9 1 10	Mean of 2, allowing for parallax		
Madina ...	9 5 20	Single meridian altitude, allowing for parallax		
Bumban ...	9 7 15	Mean of 3, ditto	11 56 8	Longitude of Freetown assumed to be 13° 14′ W.
Kawana ...	9 12 0	Mean of 2, ditto		
Kamange ...	9 17 35	Mean of F.R. and F.L. meridian altitudes		
Katimbo ...	9 21 25	Ditto		
Lengekoro ...	9 28 20	Ditto		
Kundembaia ...	9 22 55	Ditto		
Yerembo ...	9 11 25	Mean of 3 sextant and theodolite altitudes		
Alkallia ...	9 8 50	Ditto		
Kilela	9 10 10	Ditto		
Kruto	9 6 25	Mean of 4 theodolite altitudes	11 20 28·2	Longitude of Bumban assumed as above.
Nyedu	9 6 35	2 meridian altitudes, F.R. and F.L.		
Sogurella ...	9 11 0	Meridian altitudes with sextant and with theodolite, allowing for error of parallax		
Kurubundo ...	9 12 20	Mean of 3 meridian altitudes	11 1 50	Meridian distance from Kruto assumed to be 11° 15′ 20″ W.
Porpor	9 8 10	Ditto		
Buria	9 7 55	Mean of 2 meridian altitudes		
Kamindu ...	9 7 20	Mean of 3 meridian altitudes		
Tembi Kunda ...	9 5 20	Mean of 4 meridian altitudes	10 46 40	Meridian distance from Kruto assumed as above.
Bali	9 12 10	Mean of 2, allowing for error of parallax		
Mussadugu ...	9 18 30	Mean of 3, allowing for error of parallax	10 47 0	Meridian distance from Tembi-Kunda assumed to be 10° 46′ 40″.
Kiridugu ...	9 22 15	Mean of 3 (F.R. and F.L.)		
Dakolofe ...	9 41 25	Ditto		

Name.	Lat. (N.).	Remarks.	Long. (W.).	Remarks.
	° ′ ″		° ′ ″	
Songoia ...	9 45 10	1 meridian altitude with sextant		
Kalieri	9 58 0	Mean of 4 meridian altitudes		
Bibia	10 0 5	Mean of circum-meridian observations by French and English		
Junction of rivers Kita and Lolo	9 52 40	Circum - meridian : time of transit calculated by mean of results		
Kita river, at point 1500 metres north of Lakhata	9 56 0	Circum - meridian ; times as preceding		
Wellia (Wulia)	9 50 40	Circum - meridian ; time by observation	12 35 35	By meridian distance from Freetown, assumed to be 13° 14′

Positions fixed by French Commission.

Tembi Kunda ... ... Lat. 9° 4′ 55″, circum-meridian observations of stars. Long. 10° 47′ 0″
Source of Faliko ... Lat. 9° 19′ 21″ ,, ,, ,, ,,
Bambaireya ... ... Lat. 9° 33′ 12″ ,, ,, ,, ,,
Baraba ... ... Lat. 9° 46′ 10″ ,, ,, ,, ,,

Positions fixed by Major Grant, R.E.

Kruto, long. 11° 15′ 20″ (moon culminating stars).
Tembi Kunda 10° 46′ 32″ by transport of time from Kruto to Tembi Kunda and back.

Memorandum on the Map.*

The position of Bumban, where a route traverse was commenced on the journey to Tembi Kunda, has been fixed on the map by taking the latitude as found by the commission, and the longitude from Intelligence Division, War Office, map, No. 1118. Kruto has been fixed by the latitude found by the Commission (mean of four meridian altitudes), and the longitude obtained by Major Grant, R.E., from moon culminating stars. The traverse between Bumban and Kruto was made with compass, plane-table, and perambulator, and was checked by latitudes taken at each halting-place. The work thus done has been adjusted between Bumban and Kruto, which were fixed as explained.

The latitude of the British camp at Tembi Kunda was found to be 9° 5′ 20″ N. from four meridian altitudes of two pairs of stars. The French Commission fixed their camp, which was about a quarter of a mile south of the British camp, in 9° 4′ 55″ N. lat. from circum-meridian observations of stars. The Niger source, which is situated, as regards latitude, between the two camps, has been plotted as 9° 5′ . The longitude obtained by Major Grant, R.E., by meridian distance from Kruto, as fixed by him, gives to Tembi Kunda a value of 10° 46′ 32″ W. The meridian distance obtained by the British Commission from Kruto, assuming Major

* The scale of the map has been reduced to one-half that of the original, published by the Intelligence Department, War Office. The coast-line is taken from Admiralty Chart, No. 601.

Grant's longitude for that place, gives to Tembi Kunda a value of 10° 46′ 40″; whilst the French Commission, from lunar observations at Tembi Kunda, fixed the longitude at 10° 47′. On the map the Niger sources have been placed in 10° 47′ W. longitude. Between Kruto and Tembi Kunda thus fixed the route traverse, made in the same way as between Bumban and Kruto, has been adjusted.

From Tembi Kunda to the 10th parallel north latitude a triangulated survey was made, and was checked by observations for latitude. The survey closed between Tembi Kunda, as fixed above, and the 10th parallel with a very small error of latitude, the latitude by triangulation being short of that obtained by observation. This error was adjusted by adding to the sides of the triangles as computed a percentage so small as to be hardly perceptible on the scale of $\frac{1}{125000}$, on which scale the triangulation was originally plotted. The triangulation was checked by three observations for true bearing, which gave the magnetic variation as 18° 12′ to 18° 20′. Similar observations made by the French Commission gave the same results. In triangulating, the magnetic bearing of the R.O. was observed from each trigonometrical point, and the result was used for checking the bearing of the sides of the triangles in pletting. Assuming, therefore, the longitude of Tembi Kunda to be good, that now given for Kalieri, *i.e.* about 11° 14′ W., is probably very close to the true value.

Falaba has been left in the position given to it in Intelligence Division, War Office, map, No. 1118; but if Kalieri is now correctly placed in longitude, it will probably be necessary to give Falaba a value as much east of the present position as Kalieri is east of the position given on Intelligence Division, War Office, map, No. 1118; as, although Falaba was not visited by the Commission, its position with reference to Berea Futambu, Kalieri, and Simitia appears to be very accurately given on the Intelligence Division map.

In working westwards along the 10th parallel north latitude, distances were measured with the perambulator. The longitude of the terminal point of this section of the frontier on the left bank of the Kaba, near Yomaia, was obtained from a lunar photograph (Captain Hills' method), and the result agrees very closely with the survey work. The distances surveyed each day being short (from three to four miles), any great error in the perambulator measurements is improbable, and the results confirm the position of Kalieri as fixed above.

Between the Kaba river and Wellia, latitudes by circum-meridian observations of stars were taken at the Kita-Lolo junction, at the point above Lakhata where the boundary leaves the Kita, and at Wellia. The perambulator broke down near the Kita-Lolo junction, and could not be used again. Distances were afterwards obtained by pacing. For Wellia the latitude obtained by observation has been taken, and the mean of the longitudes obtained by Major Kenney in 1891, by time observations by the Commission (meridian distance from Freetown), and from a photo-longitude plate, has been adopted. This position agrees with the survey work, which has been adjusted between the Kaba river and Wellia thus fixed.

The position of Kukuna has been taken from Intelligence Division, War Office, map, No. 1118, and the route traverse has been adjusted between Wellia and Kukuna. Distances on this section were measured by pacing, a mean being taken of the result given by the Commissioners and the three sappers. No observations were possible owing to the clouded state of the sky.

In the Samu frontier, the positions of Kiragba and the Mola river have been taken from the Intelligence Division map, and the survey work has been adjusted between these points.

A report by Captain Hills, R.E., on the photo-longitude plates is attached. For the purposes of the map the results obtained from plates 4 and 5 have been used,

and have proved very valuable in checking the survey work. Plate 2 (Mussadugu) has not been used, as it is not in accordance with the position obtained for Tembi Kunda and with the survey generally, and probably some error, not at present apparent, has crept into the work.

REPORT ON THE PHOTO-LONGITUDE PLATES, TAKEN BY LIEUT. A. H. TYLER, R.E., ON THE NIGER IN 1895 AND 1896, BY CAPTAIN HILLS, R.E.

These observations were taken with the object of testing the practicability, in the field, of a photographic method of longitude determination, which had been proved capable of giving good results when tried under observatory conditions.

The instrument supplied to Lieut. Tyler was one specially designed for the work. It was provided with a Zeiss anastigmatic lens of about 15½ inches focal length, the plates being 6¼ inches square. The plates were all developed on the spot, and were sent home to be measured and computed. The measurements were all done by myself, and the computations were done, under my directions, by Mr. W. H. Walmsley, of the Nautical Almanac Office.

The work in the field was all most carefully and excellently carried out, and great credit is due to Lieut. Tyler.

The results obtained from the plates are extremely satisfactory; one only was a failure, viz. No. 3, taken at Kalieri.

The cause of the failure was that it was taken when the moon and stars were at a low altitude, and there appears to have been a considerable amount of mist or light cloud about.

The best plate was No. 5, Wellia, and as an illustration of the amount of concordance to be expected in the measurements of a good plate, I give the result of plate 5 in detail.

The longitude of the place of observation was deduced from the measurement of seven moon images on the plate. Working out the result separately for each moon image, we get the following:—

Moon.	Longitude.	Mean.
	° ′ ″	
1	12 31 5	
2	33 8	
3	30 36	° ′ ″
4	32 36	12 31 32
5	31 0	
6	30 18	
7	32 1	

The probable error of the mean being, therefore, 11″ of arc, equal to about one-fifth of a mile.

It must not, of course, be understood that it is claimed that the mean result is correct within this small limit, as there may be constant sources of error affecting all the moon images equally.

It is difficult to say exactly what are the limits of error, but I think it is not unfair to assume that the results are correct within 1′ of arc (equals 1 mile).

It is unlucky that there was no opportunity of taking a series of plates at one station, the results of which could have been compared together, but it must be readily admitted that in work of this class such an opportunity would rarely occur.

The results of all the plates are given on the table annexed to this report.

Plates 4 and 5 have been corrected for the errors of the moon's predicted place, the moon having been observed that night at Greenwich.

Plates 1 and 2 have not been so corrected, so it is possible that they may require a small correction, which could be applied should it be discovered that the moon's true place was observed on that night at any observatory.

Plate 4 was not a very satisfactory one, owing to the long interval (8 hours) which elapsed between the two sets of star exposures. It is impossible to believe that the camera should have remained absolutely stable during such a length of time, but, on the other hand, the measurements themselves show that the amount of displacement, if any, did not exceed a very few seconds of arc, a result highly satisfactory as exhibiting the stability of the instrument.

It is also interesting to note that in this plate there was an error in the last star exposure, which might have been due to a displacement of the camera or to the time of exposure having been wrongly recorded. This has had no effect on the result, as the star image in question has been simply ignored in the computation, but it is satisfactory to see how readily such an error is detected when the plate is measured.

TABLE OF RESULTS OF PHOTO-LONGITUDE PLATES.

Plate.	Date.	Place.	Approximate Longitude from previous Observations.	Longitude from Plate.
			° ′	° ′ ″
1	1895, Dec. 25	Bumban	11 54 W.	11 46 9
2	1896, Feb. 3	Mussadugu ...	10 47	10 56 43
3	Mar. 4	Kalieri	11 16	No good
4	Mar. 29	Kaba river ...	11 56	11 55 57
5	April 29	Wellia	12 34	12 31 32

A JOURNEY IN SOUTH-WESTERN PATAGONIA.*

By OTTO NORDENSKJÖLD.

In the antarctic summer 1895–96, I made an exploring expedition as leader of a party of Swedish scientific men to Tierra del Fuego, principally for the sake of comparing its natural features and history with those of North Europe. After my companions had returned, I found an opportunity of continuing my explorations in an interesting part of Southern Patagonia, with the object primarily of finding the relations between the deposits of glacial origin I had discovered the previous year in Tierra del Fuego and the great Patagonian gravel formation.† On this expedition I found an opportunity of exploring some interesting regions hitherto unknown, and of working out some contributions to the general physical geography of the territory, and of those results the following notes form a short account.

* Map, p. 464. This is a reproduction of the original sketch of Mr. Nordenskjöld, with some additions from the latest Admiralty charts.

† For the results of those researches, and for the full account of the scientific results of the whole expedition, I must refer the reader to a detailed work, which will shortly be published. A preliminary account of the results of the voyage appeared in *Die Geographische Zeitschrift*, 1896.

I spent a considerable time in a region of great actual interest, as being part of the territory presently disputed (through the boundary question) between Chile and the Argentine Republic. As may be known, the treaties of 1891 and 1893 decide that the frontier shall follow "the highest summits of the Cordilleras that form the watershed." This rather ambiguous wording of the provision has been interpreted by some of the disputants as implying that the line shall follow the continental watershed in all parts where it is to be found in the Cordillera range. Now, the mentioned territory is interesting, because the watershed undoubtedly is to the east at least of the real central Cordillera. I should be glad if my account of the structure of the Cordillera and of the orography of the country could be of any service for arriving at a better view of the question.

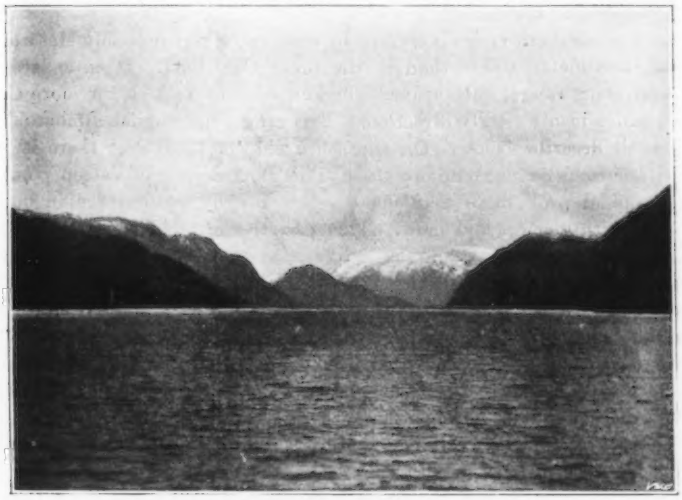
The principal feature in the orography of South America, from Cape Horn northwards, is the contrast between a high Pacific mountain chain and a wide Atlantic tableland. This circumstance causes the different parts of the country to wear aspects that are very dissimilar, but nowhere does the contrast appear so strongly as in Tierra del Fuego, where the summits of the Cordilleras, covered with perpetual snow, and very often also by clouds, rain, and fog, can all be clearly seen from the dry Atlantic coast. Not quite so rapid, but still very wonderful, is the transition in Patagonia; and the region I here intend to describe, lying between 50° and 52° south latitude, is in addition more interesting than any part of Tierra del Fuego, owing to the peculiar character given to parts of it by the presence of masses of basaltic rocks and lava cones in the east, and of great ice-fields in the western valleys.

To give an idea of the appearance of the country, we will begin by giving a profile of the continent a little north of 51° S. lat. This part of the country can be divided into three regions of very differing character, to which we may add two others of wide extent in the south of the continent. The whole country west of 73° W. is occupied, both islands and mainland, by the high snow-clad Cordilleras, deeply indented in all parts by numerous channels, sounds, fiords, and river valleys. At the latitude in question, Peel inlet penetrates from the mouth of the Sarmiento channel about 20 miles inland. Of this region I know by sight only a part of the channel just mentioned, where the rocks are generally granitic, and the most easterly part, on the inner side of the central portion, which is here built up of metamorphic slate. However, there exist besides, as shown by the boulders brought down by the glaciers, porphyritic rocks to a considerable extent.

This state of things is a general one in the whole southern Cordillera—on the western islands massive rocks, in the central continental Cordillera slate. The last named is *probably* the same as is broken off in 52° 10′ S. in the Sarmiento peninsula by Union sound, north of which no break is known in those regions. Of the interesting topography of

the country east of this chain, the accompanying sketch-map will give some idea.

The westernmost point I reached was in 50° 50′ S., 73° 10′ W. To the north and to the south, as we stand here, there is a wild range of hills with peaks upwards of 6000 feet in height, while before us is a low pass with an extensive ice-sheet, whence a big glacier descends into the valley, where it had in former times a great extent, as seen from the scratches on the mountain slopes. The valley is now filled up with the waters of a large mountain lake, with numerous "icebergs," broken off from the glacier above, floating about on its surface. The whole



VIEW FROM THE WESTERN PATAGONIAN CHANNELS.

panorama presented by the lake and the high mountains surrounding it, by the glacier with its high lofty "nunataks," and its surface cleft and distorted in a way rarely seen except in arctic regions, and by the wonderful Mount Payne in the south, is one not easily forgotten.*

The direction of the lake sets towards a narrow gorge in the south-east. From this point there opens before us, in an east-north-easterly direction, a valley about a mile in width, and shut in by steep ranges, roughly speaking 4000 feet in height, and clad on the lower slopes with dense forests of the antarctic beech. The bottom of the valley is almost flat, and through it flows the outlet of the lake, a broad river which I

* This lake I proposed to name Lake Dickson, in honour of Baron Dickson who defrayed the major part of the expenses of this as of so many other Swedish expeditions.

have called the river (Rio) Payne, its course displaying those strange meandering windings that are so characteristic of these regions. After covering a distance of not quite 7 miles, we reach another mountain lake, the whole width of the valley forming a deep water-filled depression about 3 miles in length. To get over these 10 miles on horseback was for us a hard three days' task. Sometimes we had to penetrate dense forests of shrubs, sometimes to traverse swamps where every moment our horses threatened to stick fast; while, if we tried to find our way on the hillsides higher up, we had to encounter the dense forest, and every now and then deep gorges with mountain rivulets hemmed in by steep, often perpendicular walls, and overgrown by an almost impenetrable vegetation.

The northern range is formed by slate, younger (probably Mesozoic), and less metamorphic than in the inner Cordillera. It extends as a continuous range, only sparsely broken by deep valleys, for more than 30 miles in a westerly direction. This range, the Baguales mountains, I shall describe below. On the south side of the valley there is the wild, curious Payne mountain mass. This mountain forms a steep, pointed pyramidal peak, more than 6000 feet in height, and covered in many parts with glaciers and snow. This peak is surrounded on three sides by a ring of lofty rectangular peaks with rounded summits, but with quite perpendicular walls rising to a height of thousands of feet. The rift between them and the central peak is filled with ice. As the river could not be passed on horseback at that time of the year, and we had no boat at our disposal, it became impossible to reach the mountain and explore its composition, but it looks unmistakably like an extinct volcano. As this, however, for other reasons, is rather doubtful, we can only state with certainty that it is not built up of the slates of the inner Cordilleras.

From the east end of the lake mentioned above the river Payne continues in a southerly direction, forming almost a right angle with its former course. The country it now flows through is wide and open, comparatively level, but declining gradually towards the east. The formation of the ground is of Mesozoic slate, but this is rarely visible, since it is covered by low, irregular, often sharply outlined hills, sprinkled in many cases with large stones, that elsewhere occur but rarely except among the mountains. No doubt those hills are the bottom, or perhaps the terminal, moraines left by the ice at a time of greater extent. In this territory we find two or three by no means inconsiderable lakes, and on reaching the southern border another one still larger, Lake Sarmiento. This lake consists of two parts—the proper lake in the lowland, covering an area of about 26 square miles; and its continuation to the west, a narrow channel with walls that show evident traces of ice-action, a typical fiord of the age when the Atlantic extended almost to the eastern slopes of the Codilleras. Farther

to the west there are other lakes, true mountain lakes similar to Lake Dickson, and still further in we come upon the remains of the extensive ice-sheet that once covered the whole territory.

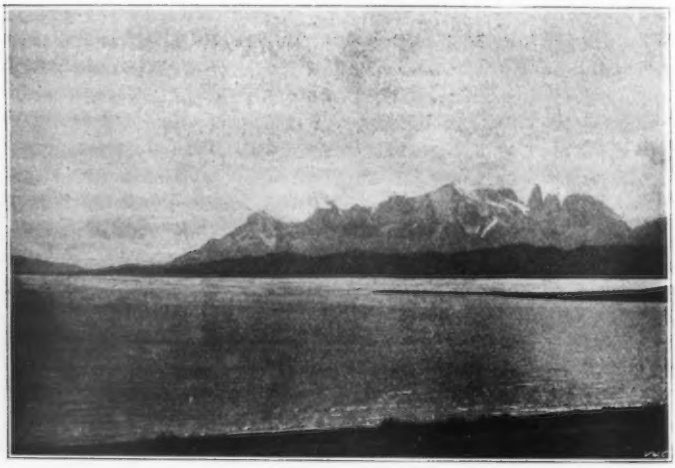
On the south side of Lake Sarmiento there rises, to a height of more than 3500 feet, a mountain that can be considered typical of a large number of others in the zone of transition between the Cordillera and the Pampa. At their foot I found slate, probably Mesozoic, highly contorted, and showing a strong cleavage; higher up, Tertiary rocks with only a slight dip. The clearly marked stratification sometimes gives

MOUNT PAYNE, FROM THE NORTH.

them a very peculiar shape, the, in part, almost perpendicular walls being separated by slopes of less inclination. But true table mountains of greater extent never occur, and mostly the mountains have rounded, weathered forms, except where volcanic rocks form the upper layers. Of this the most striking example is the range called the Baguales mountains, north-east of the Payne valley. There the soft Tertiary rocks have been protected by an immense sheet of basalt, and consequently there is a kind of peninsula here, jutting out from the Cordillera 30 miles into the lowlands. The influence of erosion has caused the basalt to assume the most wonderful forms, appearing sometimes as regular pyramids towering out from a broad base, sometimes as solitary pillars or high walls, occasionally occurring with comparatively low country all around.

South from Lake Sarmiento and the first-mentioned mountain occurs another lake, called in Spanish Lago Maravilla ("the marvellous lake"),

the largest in that great lake system. The exact area could not be ascertained, as I have only explored the eastern part, but will probably be about 70 square miles. It is surrounded by mountains except in the eastern corner, where an extensive lowland begins, sometimes swampy or covered with small lagoons, sometimes overgrown with rich grass. Through this tract of land a broad river runs, formed by the convergence of three streams descending from the Baguales mountains. Most interesting is the easterly one, the river Viscachas. It flows first east, then south, and after approaching the sources of the Coyle river within a distance of only a few miles, it bends west at a distance of 30 miles from



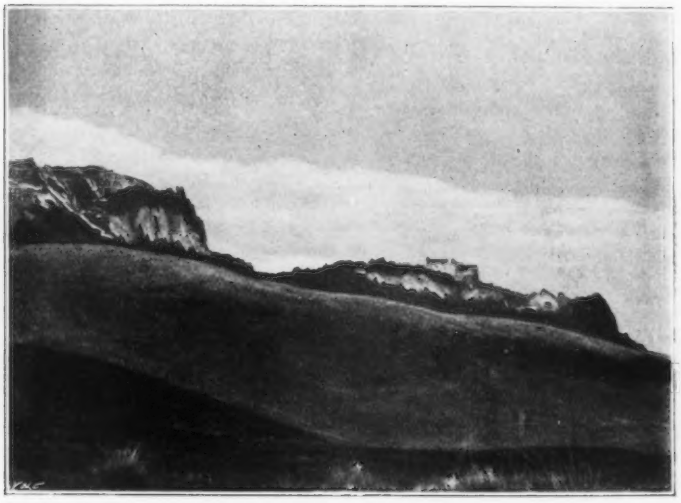
MOUNT PAYNE AND LAKE SARMIENTO.

Lake Maravilla. Its whole course is through level country, the soil consisting of slightly stratified sandy clay in which pebbles are embedded.

There exists, without doubt, a marked difference between the natural features to the east and the west of the Viscachas river, but at the same time there is a transition from one to another. Some low hills east of the river may be considered deposits left still after the erosion of the Baguales and other mountains of the intermediate zone, but they are surrounded by land similar in natural features to the Patagonian type, and that, as we proceed eastwards, soon becomes paramount. There are still sharply defined heights formed of horizontal Tertiary sandstones and conglomerates—the highest point of the so-called Latorre mountains ("Punta Alta") is about 3000 feet; but they are all table mountains, with steep slopes to the west, but a very gradual descent towards the Atlantic. The rivers and their valleys are Patagonian in their

character, sometimes running through real cañons with perpendicular walls more than 200 feet high. Moreover, not very far to the east the Patagonian pampa proper begins, its gravel-covered surface stretching for hundreds of miles. Nowhere is a single tree to be seen, and only in the valleys does a low bush now and then occur of a species of verbena, called the "black bush," and having small fleshy leaves and white strong-smelling flowers. Only in the western part are there any lakes, but, as it seems, they are shallow and always without outlet.*

The large rivers mentioned above, as well as the river Payne, all flow into the lake Maravilla, which itself has an egress to the Pacific in Last Hope inlet. The connection between the outlet of the lake and a big



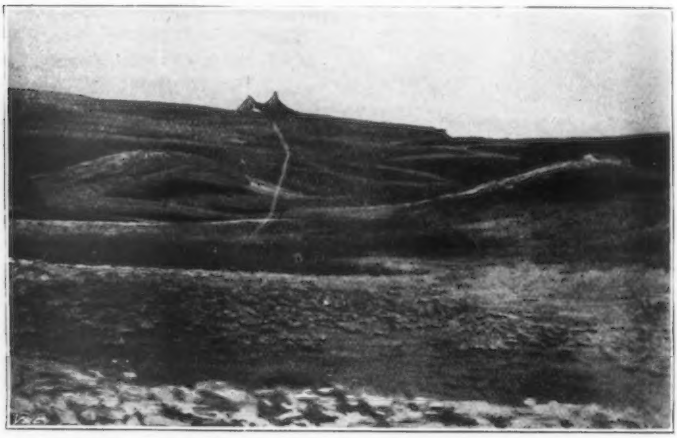
SCENERY FROM BAGUALES MOUNTAINS.

river that flows out into the last-named inlet has certainly not yet been conclusively shown, but it does not seem to be in the slightest degree doubtful that such connection exists, as no other river of that size could exist in the small territory south of a line between the lake and the nearest section of the western channels, where it could otherwise find an outlet.

South of the lake down towards Last Hope inlet and Disappointment bay, we find low land and mountains of the intermediate type. The

* Also in the western, mountainous, intermediate zone lagoons occur on the lowland which are without outlet, and sometimes even contain salt water. But it is very curious that a deep fresh-water mountain lake, such as Lake Sarmiento, should be without visible outlet, unless such outlet should prove to exist in the small section not visited by me. This, however, does not seem very probable.

bay last named, the only known part of the western channels (except the Straits of Magellan) that penetrates into a region that certainly does not belong to the Cordillera proper, is situated in a latitude corresponding to that of the valley of the river Gallegos. This valley is bounded on the north by the high Latorre range. To the east it is narrow, the hills that wall it in being lower. At 71° west its width is about 6 miles, but from 71° 20′ west it widens to a broad open plain that may be said to continue all the way to Disappointment bay, though some parts are rather high and hilly. The boundary between country with Patagonian characters and that with intermediate crosses the river at a longitude of about 71° 45′ west, and from there takes a north-west



TERTIARY HILL WITH BASALTIC CONES.

direction until it reaches 51° 30′ south. West of this line most of the country, except the swamps, is covered with forest, the lakes are deeper, and the hills rounded, not table-shaped.

The southern limit of the Gallegos valley is a tableland 600 to 800 feet high, sometimes barren, but mostly grass-covered. Here also, in the neighbourhood of the large depressions occupied by the muddy brackish water of the "White lake" (Laguna Blanca), and from these eastwards to the straits, we find the curious, steep, lofty hills composed of boulder-clay, which I observed first in Tierra del Fuego, and which are so characteristic of the formerly glaciated territory in this region.

The above descriptions we may sum up as follows: There exists, in the space of only 50 miles, a radical difference between the high snow-covered Cordillera, consisting of folded metamorphic schists, and the dry pampa tableland of Tertiary or recent age. But between those two

regions there extends a broad zone of transition, with mountains sometimes almost as high as the higher peaks of the Cordilleras, and formed partly of younger contorted slates, partly of horizontal or slightly inclined Tertiary rocks, eruptive or sedimentary. These mountains, on the one hand, topographically form a direct continuation of the Cordillera, and on the other are separated by valleys that sometimes form extensive lowlands of a character resembling that of Patagonia, and contain rivers which mostly run to the Pacific.

As regards the origin of this state of things, which makes it almost impossible to put down on a chart any boundary-line between the "pampa" and the Cordillera, if we are to give to the latter a purely topographical definition—it seems that the isolated mountains, even the actual pampa hills such as Latorre mountains, were once joined to the central Cordillera. Rivers flowing from this to the east afterwards cut out valleys, that were considerably widened by the action of great glaciers extending far outside the mountains. Such was the origin of Disappointment bay and also of the great lakes that are limited in the east by morainic material.

Of the rivers flowing out into the Pacific, some extend far eastward from the central Cordillera right to the boundary of the Patagonian pampa proper, but they do not seem to penetrate this. The largest of them all come from mountains connected with the Cordilleras.

The actual boundaries between the different zones, even when marked by orographical features, are mostly due to climatological circumstances, especially the rainfall. The zone of transition between the wet, cloudy Cordillera and the always dry pampa is very narrow, and almost coincides with the intermediate zone described above, where isolated mountains occur, rounded or ragged, but not table-shaped.

Five years ago no single white man was living in the territory in question, except perhaps, in summer-time, some few ostrich or lion hunters, but now that is all altered. Nobody has tried, it is true, as yet to utilize the forests, here on the landside consisting of *Fagus antarctica*, or the coal and minerals, traces of which have in some parts been met with, but the open land is now largely occupied. A great part of the territory, however, cannot be made of practical use; the higher tableland is almost barren, the slopes and the hilly land in the west are often overgrown with a very annoying plant, a prickly species of an Azorella, forming rounded hemispherical tussocks. Sometimes the ground is swampy, and on the open pampa the vegetation is mostly very poor. But, on the other hand, there is grass in many parts, it being, especially in the river valleys, of a very rich and soft quality; indeed, comparatively speaking, the greatest part of the country is covered with grass, not very luxuriant in places, but forming an excellent pasturage for sheep. The uniform climate, too, is very well adapted for sheep, and so sheep-farming has been the principal branch of industry, cattle and

horses, however, being also sometimes kept. The coasts of the Straits of Magellan and of the Atlantic have long been occupied, but just lately many settlers have taken up their quarters in the Gallegos valley and in the region between Last Hope inlet and the lakes right away towards the dry Patagonian pampa. Until recently land could be got very cheaply, and there is still a lot of good "camp" unoccupied, but that state of things will not last long. Most of the settlers are English-speaking people, hailing from England, Scotland, the Falkland islands, or Australia. The wool is brought down to Punta Arenas, Port Gallegos, or to Last Hope Inlet, where there is a kind of harbour, to which steamers come from Punta Arenas twice or thrice in the year to bring the provisions necessary for the immediate future.

Meanwhile the original inhabitants of the country, the Patagonian or Tehuelche Indians, are being rapidly driven back towards the uninhabitable central territory. It is long since the time when they were described as a race of giants, but undoubtedly they are extremely handsome, tall fellows, a really fine people. Those still surviving are all civilized, and there is not the slightest danger for the traveller in associating with them. They often possess fine troops of horses; some of them also own cattle. Many speak Spanish, and once or twice a year they go down to Punta Arenas or to Gallegos to exchange their guanaco mantles and ostrich feathers for different kinds of provisions and implements. But the number of guanacos is diminishing day by day, the land is being absorbed and the Indians impoverished by the white traders; they are getting mixed with the whites, and so the day cannot be far off when the last Patagonian in the old sense shall have ceased to exist.

A BRITISH PROTECTORATE IN AFRICA.*

Sir Harry Johnston's new book stands on a distinctly higher level than the great majority of books on Africa which have appeared within the past few years. It is not of mere passing interest, but is likely to long remain the standard authority on the country with which it deals, indispensable to all students of the modern development of the Dark Continent. The unusual opportunities for observation supplied by a seven years' official connection with British Central Africa, added to the author's well-known qualifications as an acute and careful observer, leave little room for doubt that the work presents a just and comprehensive view of one of the most promising recent additions to the British Empire, while the abundant and admirable illustrations, many of them from Sir Harry Johnston's own drawings, would suffice in themselves to give a vivid idea of the nature of the country described.

* 'British Central Africa: an Attempt to give Some Account of a Portion of the Territories under British Influence north of the Zambezi.' By Sir Harry H. Johnston, K.C.B. Maps and Illustrations. London: Methuen. 1897.

The author does not, however, rely solely upon the illustrations to convey a general impression of the aspect of the country, but in the opening chapter draws upon his powers of description to further contribute to the same result. With the artist's eye for the picturesque, and a keen appreciation of nature in all its varied aspects, he accomplishes his task with signal success, describing in felicitous language a series of striking scenes—from the placid river of the lowlands, with its grassy islets and fringe of palms and papyrus, to the forest gloom of the mountain slopes, through which "flit the crimson-winged turacos, the lovely genii of the African forest;" or the "Jack-and-the-beanstalk country," reached by ascending the wall-like sides of the higher mountains, where, on the cool and bracing plateaux, "daylight is one long inexhaustible joy of living." Here, as in the chapter specially devoted to botany, Sir Harry Johnston has much to say of the beauty of the flowers, especially on the higher grounds. Flowering plants and trees are either much more abundant, or, owing to the less dense vegetation, much more apparent than in West Africa, and there is a pretty constant succession throughout all the twelve months. For this part of Africa, the statement that singing birds, sweet-smelling flowers, and gorgeous displays of bloom are not characteristic of the tropics, does not hold good. Scenes less pleasing, but needed to complete the true picture of British Central Africa as it now is, are those in which the death-bed of the fever-stricken gold-prospector, or the horrors of savage war, are portrayed with dramatic vividness.

A clear account of the physical geography of the Protectorate, illustrated by useful maps, occupies the second chapter, while the next two are devoted to a concise sketch of the history of the country, both before and since the establishment of British rule, ample recognition being given to the work of all who contributed, by their patient struggle with great difficulties, to lay the foundation of existing prosperity. The mission question is one on which such conflicting opinions are expressed, that it is of much value to have the conclusions of so impartial an observer as Sir Harry Johnston stated in a chapter devoted to the subject. After some graphic and sympathetic sketches of the life and work of the missionaries as observed during frequent intercourse with them, he concludes by asking, "Who can say, with these facts before them, with the present condition of the natives in South Africa to consider, with the gradual civilization of Western Africa, that missionary work has been a failure, or anything but a success, in the Dark Continent?"

Limits of space forbid the mention of all the varied contents of the volume. Repeated reference is of course made to malarial fever, especially the deadly "black-water" variety, which the author considers the only serious drawback to British Central Africa as a field of enterprise for trader or planter. Could this demon be conjured, the

prosperity of the country would, he thinks, be almost unbounded. There are some useful hints on outfit, which, while agreeing generally with the practice dictated by experience in India and other hot countries, differ in some points in accordance with the special requirements of the climate. It will be new to many to learn that "people suffer much more from *cold* in British Central Africa than they do from *heat*." The chapter on botany, above alluded to, is followed by an equally valuable one on zoology. The concluding chapters on the natives of the Protectorate and their languages show much original research, and describe fully both the physical characters and the mental and moral traits of the various tribes. In the last chapter an attempt is made to trace the main lines of the Bantu dispersal from the site where their languages were first developed, placed by the author near the meeting-point of the Niger, Shari, and Congo basins.

THE PHLEGRÆAN FIELDS.*

By R. T. GÜNTHER, M.A., Magdalen College, Oxford.

I WAS elected to the Oxford University Geographical Studentship for 1895–6 on March 14, 1895, for the purpose of enabling me to carry out certain investigations on the physiographical features of the Phlegræan Fields, near Naples.

The objects proposed for research were—

1. The computation of the total quantity of matter erupted by each volcano and by all collectively, as an indication of the volcanic activity of the region.

Owing to the ruined condition of many of the older craters, I have been met with many preliminary difficulties. I have, therefore, devoted myself chiefly to the enumeration of the more or less recognizable craters and to their relationships.

2. The examination of the valleys on the slopes of certain of the older craters, with the ultimate intention of collecting material from which it might be possible, at some future time, to arrive at a conclusion respecting the relative ages of those crater-slopes, and of the volcanoes themselves.

A special study of the region was made during the Easter Vacation, 1895, at the Royal Geographical Society's library. I left England in order to commence work on the second of these objects on June 28. While engaged in the examination of the valley beds, I lived at a small Osteria between the monastery of Camaldoli and the village of Nazaret. I had intended to reside at the monastery itself, but the monks refused their hospitality for more than a single night to one who could not pretend that he had lost his way in the woods. My work was chiefly on the erosion curves of valleys, and in plotting out their watersheds on a map. I returned to England after the end of the first week in September, and went out to Naples during the ensuing Christmas vacation, from December 12 until January 21. I resided at Naples, and made use of the Cumana railway for reaching the more distant volcanoes.

It is with great pleasure that I take this opportunity of recording my deep sense of gratitude to the British Consul at Naples, Mr. E. Neville-Rolfe, to the monks at Camaldoli, and to the officers of the Stazione Zoologica, for the personal kindness they have severally extended to me on various occasions.

The Royal Geographical Society has still further helped me with the loan of a surveyor's level and of an Amsler's planimeter.

* For General Map (No. 1), see p. 464.

I.—THE VOLCANOES.

The Phlegræan Fields constitute but a small part of an immense area of volcanic deposits which cover all the lower stretches of country between Roccamonfina and the Sorrentine peninsula, and which extend far up the western valleys of the Apennines to a distance of some 30 miles from the coast. On the east and south these volcanic deposits are bounded by the Tertiary limestone of the Apennines and the Sorrentine chain of hills. To the west they continue for an unknown distance below the depths of the Tyrrhenian basin of the Mediterranean. The submarine volcanic deposits cannot be of less extent than those which are now subaërial, for even at Capri beds of considerable thickness have been measured. Indeed, it does not seem improbable that the submarine deposits of the bay of Naples join those of Ventotiene and the Ponza islands, and they probably extend much further.

In the vicinity of Naples, neither the tunnels that sanitary or railway engineers have driven through the hills, nor the deepest well shafts that have been sunk, have penetrated to the bottom of these deposits, or have reached any stratum of rock that is not of a volcanic origin. The well at Ponticelli was carried down 180·6 metres, through varying strata of volcanic *débris*, without reaching any other rock.

The conclusion to be drawn is, that for such a thickness of volcanic rock to have been accumulated, the volcanic fires must have been alight for a very long period of time, yielding the energy which has lifted so much matter up from below and scattered it broadcast over the surface. The original volcanoes which laid the foundations of this tract of country must have been buried over and over again by the *débris* vomited by other vents, which have in their turn been obliterated by the vast piles of ashes and lava ejected by more recent volcanoes.

Were this all, the interpretation of the more recent history of the region would be an easy matter. But the older volcanoes, in addition to suffering sepulture, have as often been partially destroyed, either by their successors or by denudation by sea or rain. By denudation, the substance of many volcanic heaps has been distributed over adjoining areas, and has often contributed to the effacement by burial of adjoining volcanic structures.

The denudation of material from one volcano and its redisposition on or around another, the formation of new volcanoes, the burial of old ones, have gone on uninterruptedly, and have produced the physiographical aspect of the country as we know it at the present day.

Some geologists tell us that most of the vast deposits of tufa which are so prominent a feature in the region, owe their present wide distribution to the action of sea-water, and that salt waves carried them to the valleys in the Apennines. Other geologists would have us believe that such a view is as unnecessary as it is absurd, and that the tufa deposits fell as dust and ashes from the air, and were somewhat compacted by rain-water. Others, again, would invoke the former existence of volcanic vents situated far from the areas where they occur to-day. At the present day all the volcanic vents which can be indubitably recognized as such are within some 5½ miles of the coast-line between Vesuvius and Cumæ.

Subdivision of Volcanic Area.

The area under consideration may therefore be very naturally divided into two regions—the region of the volcanoes, and the region of the volcanic plains.

The *first region*, of *volcanoes*, may be defined as that in which the actual volcanic vents are situated. It is characterized by its uneven nature, its burnt soils, its crater-like hills and hollows, volcanic ridges, and trachytic rocks.

The *second region*, of *volcanic plains*, is that which contains no volcanic vents, but its rocks and soil are composed of volcanic *débris* ejected or denuded away from the first region and spread over the second region by water or other agency. It is characterized by its level stretches of volcanic soil, usually of the most fertile kind.

This division is one which has long been recognized by the inhabitants of the Neapolitan provinces, who speak of the second flat region of fertile plains as the *Campagna Felice*, and of the first as the *Campi Flegræi*.

The Campi Phlegræi, or "Burning Fields," then, owe their character to the fact that within their confines the topographical features are chiefly the result of the assemblage of a number of craters of volcanic disturbance grouped in close proximity to one another. This region of volcanic vents extends over about 50 square miles, the greater part of which lie within a rectangle measuring 12 miles from east to west, 5½ from north to south. On the south the land runs out into two promontories, which limit the east and west sides of the bay of Pozzuoli. On the east is the Posilipo ridge, terminating in the island of Nisida; on the west is the Baia-Miseno promontory, extending out towards the islands of Procida and Ischia.

Topographical Features due to Volcanic Action.

Leaving aside all consideration of the more extensive movements of subsidence and upheaval, which probably affected more or less of the entire region of the Phlegræan Fields, volcanic activity, as far as it has been the cause of the chief topographical features, has manifested itself locally by the ejection of rock from definite vents in one of two ways.

1. By the slow outwelling of fluid materials from the vent, resulting in the formation of lava streams, as near the Solfatara; or of heaps of lava, as in the crater of Astroni, according as the inclination of the surface of the ground was more or less inclined, and the lava more or less fluid (see p. 434).

2. By the rapid explosive discharge of matter from below, generally with the effect of enlarging the aperture of the vent, and of thus forming a volcanic "crater" surrounded by a circular heap of cast-up *débris*, scoriæ, lapilli, etc., of greater or smaller diameter according to the violence of the explosion.

The first process is usually only a burying one, the second as often destroys near objects by the force of the explosions. Within the memory of man all volcanic action has been subaërial, but many vulcanologists seem to think that some of the older eruptions have been submarine. The topographical features which have resulted from one or other of the above-mentioned manifestations of volcanic activity have taken the form of circular depressions in the ground (Fondi di Baia), conical heaps of ashes (Monte Nuovo), or of tufa (Campiglione) with crater-hollows in their summits, segments of tufa (Capo Miseno), ridges of tufa (Posilipo), and others.

The object of the present paper is to show how far the chief topographical features of the Phlegræan Fields can be shown to be capable of explanation as portions of volcanic craters or of their ring walls, and to endeavour to define and localize the volcanoes of which they are supposed to have formed a part.

Before proceeding to a detailed description of those topographical features of the Phlegræan Fields which may be explained as having once formed part of volcanic craters, it is necessary to state that the interpretation of the word "crater," which is adopted here, is that it is typically a circular cup-shaped excavation in the ground caused by a volcanic explosion, and is usually surrounded by a circular ring wall of *débris* thrown out by that explosion.

The only sure means of identifying such a crater is afforded by a knowledge of the geological structure of its walls and of the ground beneath it. In many cases,

as, for example, on the sea-bottom or on the surface of the moon, it is impossible or impracticable to obtain information concerning geological structure, and we are then compelled to resort to the configuration of the supposed crater and its walls.

In the description of volcanic craters and cones, the inner and outer slopes may be conveniently designated by the terms *crater-slopes* and *cone-slopes* respectively. A crater ring-wall will be limited by crater-slopes interiorly, and by cone-slopes exteriorly.

In the present paper, the following considerations have been found useful as indications of volcanic craters and of their position:—

1. If a hill is convex towards one side and concave towards the other, it is assumed that the crater which it formerly surrounded was situated on the concave side, and that the radius of the crater at any level is indicated by the radius of the arc formed by the horizontal projection of the horizontal curve of the crater-slope at the same level.

2. A further indication of position is afforded by the fact that in almost every case the natural crater-slope is much steeper than the corresponding cone-slope.

3. If arc-shaped hills be so situated that a curve approaching a circle can be drawn so as to pass along all their ridges, it is an indication that the hills are parts of one and the same crater wall.

4. In the Phlegræan Fields there is nothing more common than to find volcanic cones denuded on the side facing the sea (Nisida, Capo Miseno). It is therefore probable that the last vestiges of a volcanic crater ring will be on the land side.

5. When one volcanic ridge intersects another, the one which ends in the circumference of the other is likely to be the older.

6. *Ceteris paribus*, greater incompleteness, gentler slopes, more conspicuous marks of erosion and denudation are indications of greater age.

Distribution and Enumeration of Volcanic Craters.

The volcanic hills of the Phlegræan Fields are grouped along a crescentic area of which the horns are turned to the south more or less symmetrically on either side of the old Roman road running north from Pozzuoli to Capua, now known as the Via di Campana. The two horns of the crescent coincide with the two headlands of Nisida and Capo Miseno at the eastern and western limits of the bay of Pozzuoli, the town of Pozzuoli being situated near the centre of figure of the crescent.

As will appear in the sequel, the conception of distribution over a crescentic area is a useful one, because the more recent volcanoes are arranged along the inner border, the outer border being occupied by the wrecks of older ones.

The following grouping of the chief volcanic hills and craters is necessarily quite arbitrary, but it seems convenient to adopt some classification. Formations considered to be parts of craters of demonstrable position are numbered with Arabic numerals. Formations of volcanic origin of which the craters cannot be recognized are indicated by letters.

I.—Baia-Miseno Group.

1. Capo Miseno.
2. Porto Miseno.
3. Bacoli.

4 and 5. Fondi di Baia.

6. Baia.
   - (*a*) Monte Salvatichi.
   - (*b*) Monte di Procida.

II.—Avernus Group. (Map II.)

7. Monte Nuovo.
8. Lago d'Averno.
9. Monte Grillo, Monte Rosso.
10. Cuma.

III.

11. Campiglione.
    La Starza.
    (*c*) Monte Ruscello.
    (*d*) Monte San Severino.
12. Montagna Spaccata.

IV.—Archiagnano Group. (Map IV.)

13. Cratere di Campana.
14. Solfatara.
15. Astroni.
16. Archiagnano.
17. Cigliano.
    (*e*) Pacifico ridge.
    (*f*) Astroni-Cigliano ridge.
    (*g*) Crisci mound.

V.—Camaldoli Group.

18. Quarto.
19. Pianura.
20. Soccavo.

VI.—Naples—Posilipo Chain.

21. Naples.
22. Chiaja.
23. Fuorigrotta.
24. San Strato.
25. Santa Teresa.
26. Nisida.

1. *Capo di Miseno.*

The most southerly point of the Phlegræan Fields is marked by the conspicuous square-topped hill of Miseno, which was shown to possess the geological structure of a volcanic crater by Scrope in 1825 (15, p. 435). The existing peak (Fig. 1) is the north wall of a crater, the southern wall of which has been washed away by marine erosion. The eastern and western walls, although much denuded, are indicated by the spurs from the north wall, which carry the lighthouse and the old ruined watch-tower respectively. Their cliffs fall precipitously to the sea, a feature common to all the more exposed headlands of this coast. The section of the east crater-wall exposed exhibits the turtle-back structure, so characteristic of volcanic ash-cones.

2. *Porto di Miseno.*

To the north of Capo Miseno lies the harbour of Miseno (Fig. 2), a basin somewhat constricted in the middle, of figure-of-8 shape, which opens widely to the sea between the Punta Terone and the Punta di Pennata. Separating the inner part from a shallow lagoon, the Mare Morto, is a sandy beach which is continued all round the land side except on the north, where it passes into the cliffs formed by the volcanic cone of Bacoli. The depth of the inner harbour gradually increases

towards the outer basin. On the other hand, the outer part of the harbour is for the most part enclosed by steep, rocky cliffs, and it is deepest in the middle, becoming shallower towards the sea, from which it is separated by a distinct bar traceable on the sea-bottom. The outer pool of the harbour is 59 feet (12½ metres) at the deepest place, but the greatest sounding on the bar is only 29½ feet (9 metres).

The outer harbour of Misenum has, I think, every claim to be considered as a submerged crater. The greater part of its periphery can be traced; there are the cliffs below the hill of Misenum, ending in the Punta Terone on the south. There is the little eminence (Punta Saparella) with the ruins of the theatre of Misenum; there is the ridge terminating in the Punta di Pennata, in which the arrangement of strata characteristic of the cone-slope of a volcano can be clearly seen (Fig. 3); and, finally, there is the submerged bar extending across the mouth of the harbour.

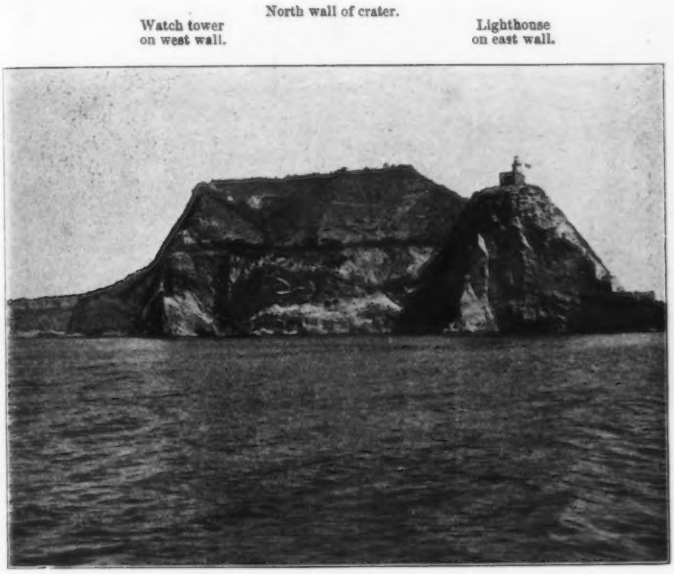


FIG. 1.—CAPO DI MISENO, FROM THE SOUTH.

On the other hand, I see no reason for accepting the view that the inner harbour is a crater. It has a greater resemblance to the neighbouring lagoon of the Mare Morto, and has probably been shut off by a sand-bar on the west of the Porto di Miseno crater, just as the Mare Morto has been shut off from the sea by the Spiaggia di Miniscola.

3. *Bacoli.*

The horseshoe-shaped hill upon which the little village of Bacoli and an old Roman reservoir—the Piscina Mirabilis—are built, exhibits every sign of being the remains of an old volcanic cone with a well-defined crater, the eastern wall of which has been removed by the action of the waves. The base of the southern wall has also suffered denudation to a slight extent, and its low cliffs partly shelter the harbour of Misenum from the north wind (Fig. 3).

4 and 5. *Fondi di Baia.*

Between Bacoli and Baia are situated two small adjacent craters, which seem to have been excavated by two series of explosive outbursts occurring simultaneously at the two ends of a cleft in the ground, or from two vents, one situated

FIG. 2.—PORTO DI MISENO, FROM CAPO MISENO.

in each Fondo. The Fondi represent a state of volcanic activity which has been paralleled by Vesuvius. Scacchi records the formation of two twin craters at the top of the mountain on February 23, 1850. The Fondi are situated on the cone-

FIG. 3.—PORTO DI MISENO.

slopes of the Baia volcano, and must therefore be of a later date—otherwise the greater quantities of matter ejected by the latter must have filled up and obliterated, at any rate, the nearer Fondo. The crater-slopes of the Fondi di Baia are now cultivated with vines.

MAP II.

CUMA, LAKE AVERNUS, MONTE NUOVO, M. GRILLO & M. ROSSO

6. *Baia.*

Only half of the walls of the crater in which Baia lies have been preserved, and even they seem to have undergone partial destruction by erosion on the west, and by the eruption of the Fondi di Baia on the south. The crater-slopes, however, can be traced, cradling round the bay of Baia, from the Punta dell' Epitaffio to the Fortino di Tenaglia, below the castle built by Don Pedro de Toledo.

A large portion of the bay is very shallow, and soundings have revealed the presence of shoals off the Punta dell' Epitaffio. In some places the submerged ruins of Roman buildings are still to be traced.

(*a*) *Monte Salvatichi.*

(*b*) *Monte di Procida.*

To the west of the Baia-Miseno chain of craters are two massive ridges which Breislak, with his usual facility, interpreted as segments of the same volcanic ring.

The Monte Salvatichi (Fig. 2) has had its south-east extremity augmented in height by the neighbouring Fondi di Baia.

The Monte di Procida is steep towards the north-east. The slopes on the south-west side are gentle from the top of the ridge to the top of the cliffs, but then fall away precipitously to the sea. The ridge terminates abruptly to the north-west and south-east (Fig. 3). Detached from the mainland lies the small flat island rock—the Scoglio di S. Martino. The section of the hill shows that its height has been augmented at very various times, and that extensive denudation has gone on in the intervals. The products of the eruption of the Procida volcanoes seem to be interstratified with those of the mainland (Johnstone-Lavis).

The Avernus group of volcanoes are shown in Map II.

7. *Monte Nuovo.*

The most recent of the Avernus group of volcanoes is the well-known Monte Nuovo, a heap of pumice and lapilli 489 feet (149 metres) in height and ⅔ mile (1 km.) in diameter, which sprang up in a few hours on September 29 and 30, 1538, on the periphery of the crater of Lake Avernus. The larger part of the Lucrine lake was filled by the *débris*, and during the seventeenth century the remainder was so "choaked up by the horrible and astonishing eruption of the new Mountain," that Sandys refers to it as a "little sedgy plash," and Ray as a "fenny meadow." To-day the renaissance of oyster-culture has resulted in the uprooting of the weeds, and in the deepening of the lake; but even as late as the beginning of the present century, travellers confirm Swinburne's description—"a slimy bed of rushes covers the scattered pools of this once beautiful sheet of water." The Lucrine never seems to have been a deep lake, for, judging from the account of Strabo, it was too shallow for vessels even of small draught. Nor does it seem likely that Agrippa would have undertaken his expensive harbour-works had the Lucrine been sufficiently deep as an anchorage for his fleet. A sketch of part of the lake, inscribed "Stagnv," appears upon two Roman glass vases, together with other topographical details (6, p. 435).

8. *Avernus.*

The crater wall of Lake Avernus is complete, but is very low towards the south-east—a circumstance of which Agrippa took advantage when he placed the lake in communication with the sea by means of his ship canal. At the present day no trace of the harbour works can be seen owing to their total obliteration by the eruption of Monte Nuovo; but it is just within the bounds of possibility that the dip of the top of the cone of Monte Nuovo towards the south and east may be due to some depression in the level of the ground before the eruption, and that depression may have been along the course taken by the canal of Agrippa.

Being unable to discover any record of a systematic series of soundings of the

lake, and finding the depths given by various authors to vary from infinity to 250 feet by one (Phillips), and 108 feet by another,* I made a few soundings across it, and found to my great surprise that, instead of being much deeper in the centre and gradually shoaling towards its circumference, it was of a uniform depth of 34 to 35 metres over the greater part (Map III.). The lake is at present surrounded by a masonry wall, built, it is said, in 1858, just before the end of the dominion of the Bourbons.

9. *Monte Grillo and Monte Rosso.*

The wall of the Avernus crater, with the exception of the gap to the south-east, is of a fairly uniform height of over 260 feet (80 metres), but at two points it attains to heights of 380 and 318 feet (116 and 97 metres) respectively. At these two points the wall intersects a curved range of hills, known as Monte Grillo to the west (Fig. 4)

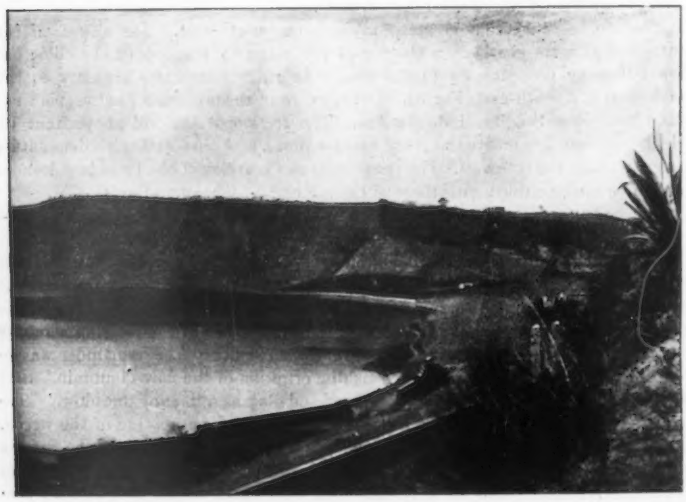


FIG. 4.—LAKE AVERNUS, FROM NORTH-EAST CORNER.

and Monte Rosso to the north, which enclose the Schiana plain. Near the middle of this range is situated the Arco Felice, beneath which the Via Cumana passes. The arch is 63 feet in height, and is said to have once supported an aqueduct.

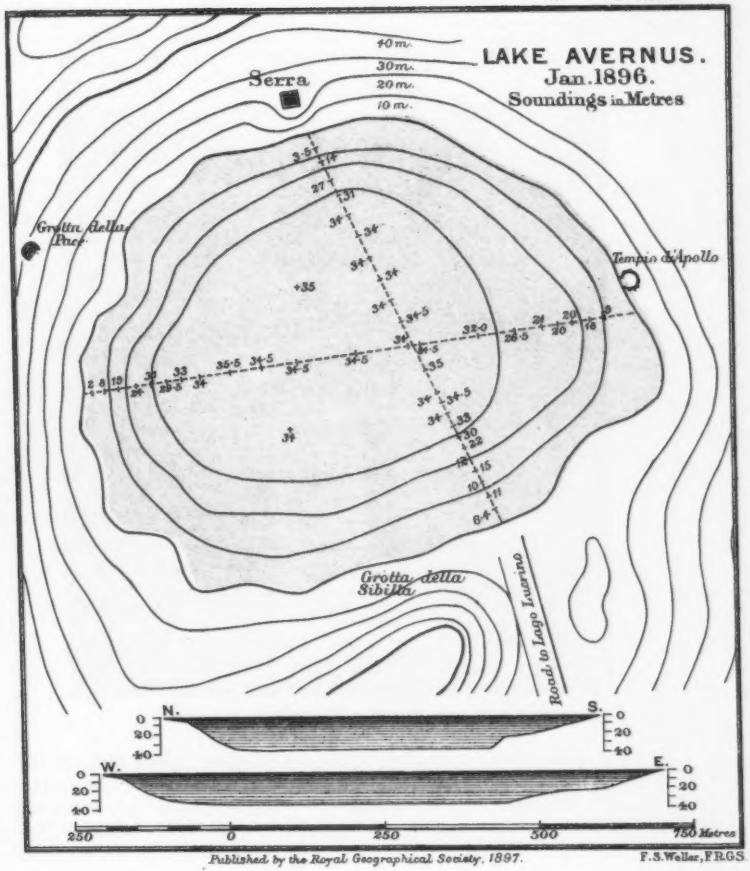
The general appearance of the Grillo-Rosso range, when viewed from a neighbouring height, is quite that of a segment of the walls of a large crater. Avernus arose in the south-east side of this Grillo-Rosso crater, just as, at a later date, Monte Nuovo sprang from the south-east of Avernus (Map II.).

10. *Cuma.*

To the west of the Grillo-Rosso cone, and rising up between the lagoons of Fusaro and Licola, is the hill which once bore the Acropolis of Cumæ. On the west and north, precipitous cliffs of trachyte (Fig. 6) supplied the citadel with a natural fortification against attack from the sea. On the south-east it is connected

* Eighteen fathoms—'Bishop Burnet's Travels.' 1686.

MAP III.



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F.S. Weller, F.R.G.S.

with the high land of Monte Grillo by a broad, gently sloping ridge, upon which the abundant ruins testify to the importance of the old city.

While seeking for some other trace of the crater wall, of which the hill of Cuma might be a part, I noticed that the cliffs to the south project slightly towards the sea, forming a spur which may be recognized on the contoured map to the west of the amphitheatre. At a little distance from this spur, and between it and the sea, there is a small isolated mound of tufa rising above the surface of the sandy beach. This spur and mound seem to me to be strong indications that a ridge of tufa once existed extending seawards from the cliff, but that all traces

FIG. 5.—ARCO FELICE.

of it have been washed away by the sea excepting the little mound of tufa. If this suggestion be a true one, this ridge might represent part of the southern wall of the old Cuma volcano, the cliff might mark the site of its eastern crater-slope, and the centre of the crater might lie on the perpendicular bisector of the line between the Acropolis and the mound.

11. *Campiglione.*

Occupying an almost central position in the Phlegræan Fields, the crater walls of Campiglione are the highest of those erupted from a single vent, and are among the most picturesque. The crater wall reaches an elevation of 1047 feet (319 metres) on the northern side (Monte Corvara), and 1079 feet (329 metres) on the southern (Monte Barbaro, or Monte Gauro). The sea has made extensive inroads

upon the south-western and south-eastern flanks, with the effect of considerably lowering the walls of the crater on the east and west (Fig. 7). The steepness of the southern cone-slopes of Monte Barbaro, as compared with the cone-slopes of Monte Corvara, is doubtless due to the same agency.

The cone-slopes of Monte Corvara are continuous with the crater-slopes of the western Quarto; they touch those of Monte Rosso on the west, and perhaps overlie a part of Monte Ruscello. Upon Monte Corvara is found a liberal coating of scoria and lapilli, similar to those found round the vent of the Montagna Spaccata volcano. On the northern side of the crater, a spur of doubtful significance traverses the crater-slope.

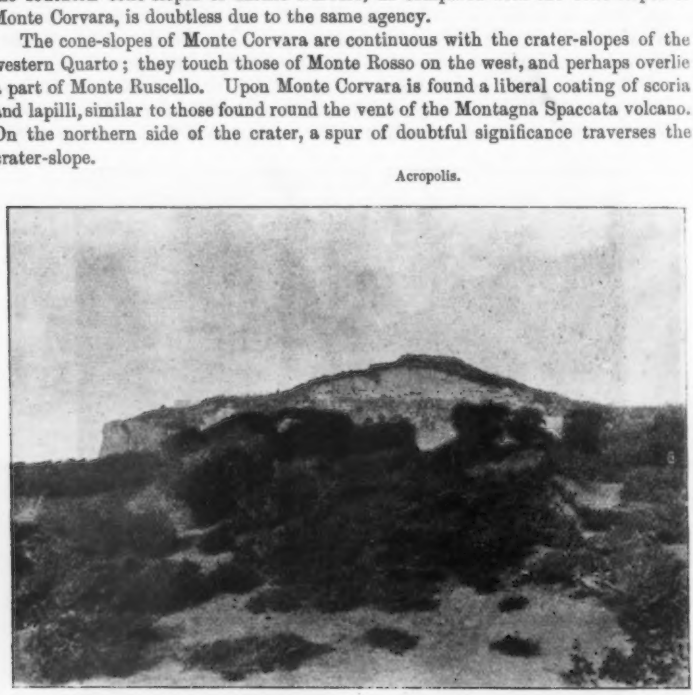

FIG. 6.—MONTE DI CUMA, FROM THE SOUTH.

La Starza.

The east and south flanks of the Campiglione rise abruptly from a plateau, 50 to 70 metres above sea-level, upon which Monte Cigliano also stands, and which seems to owe its height to material denuded from surrounding cones, especially from that of the Campiglione, and perhaps from the Montagna Spaccata. This plateau terminates on the south in cliffs, known as La Starza, containing sufficient quantities of marine shells to prove their marine origin.

(*c*) *Monte Ruscello.*

Monte Ruscello is a very problematical rounded dome of tufa, in which I have hitherto been quite unable to detect any indication of crater structure. Should it really be a portion of a crater wall, it seems more likely that the remainder lies buried beneath the flanks of Monte Corvara than that it has been washed away by the western sea. It may be a complete volcanic cone, which either never had or has lost a crater situated on its summit. It is extremely unlikely that it has anything to do with Monte San Severino. The undenuded character of its sides seems to show that it is a far younger structure.

(*d*) *Monte San Severino.*

Monte San Severino, or Monte Gaudo, is a long ridge of tufa lying in a south-west direction tangentially to the north side of the walls of the west Quarto, to which in its morphological character it bears considerable resemblance. Like them, it slopes gently towards the north, but more steeply to the south, and, like them, it is furrowed by a series of channels of great depth in proportion to their drainage areas. The point of intersection of the Monte San Severino with the west Quarto is marked by a small rise in height to the north of the Masseria Spinelli—367 feet (112 metres) above sea-level.

It seems possible that it is the last denuded upstanding remnant of the northern segment of a crater, not unlike the west Quarto, but of older age, which was broken into by the eruption of the west Quarto, as Monte Nuovo has broken into the periphery of the Lake Avernus crater. If the Monte San Severino ridge be analogous to the north wall of the Quarto, its crater would have been situated to

FIG. 7.—CAMPIGLIONE VOLCANO, FROM THE WEST.

the south of the ridge. The narrowness of the ridge would seem to indicate that here we have the crest of the crater wall, and that the remainder lies buried below the level of the country and the walls of other volcanoes.

12. *Montagna Spaccata.*

The occurrence of a stratum of volcanic ejectamenta, scoria, lapilli, etc., all over an area lying to the south of the Piano di Quarto, to the west of the Cratere di Campana, and over a considerable portion of the Campiglione volcano would lead one to suspect the existence of some comparatively recent subaërial volcanic vent in that region. The centre of this scoria-covered area lies near the Roman road which was cut through the Montagna Spaccata, from which cutting the hill derives its name. The section of the Montagna Spaccata disclosed shows that the hill was constructed of matter, not ejected from the Quarto, but from the south—a fact which tends to show that it is the north wall of a volcanic vent (Deecke, **4**, p. 435). No trace of the southern wall is to be seen, unless the Crisci mound (p. 427) represents a portion of it. Its destruction was probably partially effected by the waves that denuded the eastern side of the Campiglione, and which covered the site of the vent of the crater with tufa denuded from the neighbouring volcanic cones.

13. *Cratere di Campana.*

To the north of Astroni is an exceedingly interesting series of concentric crater

rings, which are but seldom visited, owing to their being a little out of the round of the ordinary tourist. The quantity of matter erupted by the Cratere di Campana is but small compared with their neighbours. Their walls are thickly covered with chestnut woods, which often render it difficult, occasionally impossible, to obtain a clear view of the conformation of the ground. The eruptions seem to have been entirely subaërial. Lava-like flows can be seen in several places, which are thought by Deecke to be due to the partial flowing of fused hot cinder bombs ejected from the crater. The chief interest of the Cratere di Campana lies in the fact that they show very clearly how the volcanic forces at that spot gradually weakened and finally became altogether extinguished.

FIG. 8.—LA SENGA.

Three almost concentric crater walls can be made out. The outer can be most readily distinguished to the east, where it is separated from the middle crater wall by a deep trench, the Fossa Schianana or Schianata. On the north it is covered with the Maranisi woods.

The middle crater wall touches the crater-slope of the outer one, both on the north and south.

The innermost and youngest crater, or Fossa Lupara, has very steep crater-slopes on the south and east, indicative of a final explosive act before it became quiescent. On the western side the crater-slopes are more gradual, and several (three) successive steps or terraces can be traced. At the bottom lie several large blocks of trachyte, one of which measured 4 feet through.

MAP IV.

ARCHIAGNANO GROUP OF CRATERS.

In the rock on the eastern side of the Fossa Lupara, Breislak, Scacchi, and others record a narrow fissure of great depth called la Senga. Deecke (4) writes that, in 1885 and 1887, in spite of great facilities for studying the Fossa Lupara, he was unable to discover this fissure, and suggests that it had perhaps closed up, and was concealed from the eye by the vegetation. Guided by a goatherd, I had no difficulty in finding the Senga in the winter of 1896.

The Senga is a straight chasm extending across the eastern wall of the innermost crater in a radial direction running east and west (compass bearing 86°). I was able to trace it for some 50 yards, although it has become covered over in places by the surface soil and vegetation. Even where it is covered over, there are occasional pitfalls leading down into it, which might prove dangerous death-traps to any one trying to walk across them in the dark. The fissure seems to vary in width from 3 to 6 feet. Its depth is about 128 feet (39 metres). The eastern end (Fig. 8) can be easily entered to a depth of about 18 feet, but, not having a rope or assistance, I did not venture upon a further descent.

The Senga has either been caused by an earthquake or is a split due to the shrinkage of the walls of the volcano on cooling, and, as such, has been rightly compared to the cave beneath the Monti Rossi, near Nicolosi, on the slopes of Etna. If the Senga owes its origin to either of these causes, the same cause seems to have operated upon the other side of the Fossa Lupara, where I noticed two similar cavities in the crater wall, though on a smaller scale.

The next group of volcanic hills to be considered are those which seem to have sprung up around the ruins of an old crater wall, for which I propose the name of Archiagnano (Maps I. and III.).

14. *Solfatara.*

Of this group, the Solfatara is stated to have been in eruption in 1198, and at the present day its fumaroles attract the greatest amount of attention given by tourists to the volcanic phenomena of the Phlegræan Fields. The crater of the Solfatara is one of the most perfect, but the amount of matter erupted from it seems insignificant; to the north no trace of a cone is visible. At different times there have been lava-flows from its eastern side.

On the southern side of the Solfatara rises the great trachyte-capped boss of Monte Olibano, which was shown by Guiscardi to be of more recent origin than the yellow tufa of Monte Dolce. In the British Association Report of 1890, Johnston-Lavis suggests that this eruption of lava occurred at a considerable time after the sea had deposited the Starza cliffs and had partially denuded Monte Barbaro.

15. *Astroni.*

To the north of the Solfatara, and connected with it by a ridge, is the beautiful cone and crater of the Astroni. For our present purpose, the important facts to note about it are, firstly, that there is a spur running down the south-west crater-slope; secondly, that the highest points of its walls are on opposite sides of the crater at the Torre Nocera and the Torre Lupara; and, lastly, that the major axis of the elliptical crater lies across the line between these two high points.

16. *Archiagnano.*

At the foot of Astroni, cradled by hills, lies the plain which, before 1870, was partly covered by the lake of Agnano.* The eastern side of this plain is shut in by the well-preserved curved ridge of San Domenico, the northern boundary is shared with Pianura, the western is apparently replaced by the cone-slopes of Astroni. Upon the south, the walls are more irregular; their symmetry being marred by

* It is a significant fact that no mention is made by any Roman author of a lake upon the site of Agnano.

three projections, the Colles Leucogæi, or cone-slopes of the Solfatara, the northern spurs of Monte Dolce, and Monte Spina (Maps I. and IV.).

The original western wall is indicated by the two ridges, of which one is intersected by the craters of the Solfatara and Astroni, the other by those of Astroni and Pianura. The points at which these ridges intersect the Astroni crater walls have already been noticed. The Solfatara-Astroni ridge forms the Torre Nocera, and to it doubtless is due the spur upon the crater-slope in Astroni, just below the Torre Nocera (see Fig. 9). The Astroni-Pianura ridge forms the Torre Lupara, the second highest summit of the Astroni cone. Both the Nocera and Lupara ridges, as the Solfatara-Astroni and Pianura-Astroni ridges may be called, lie along the

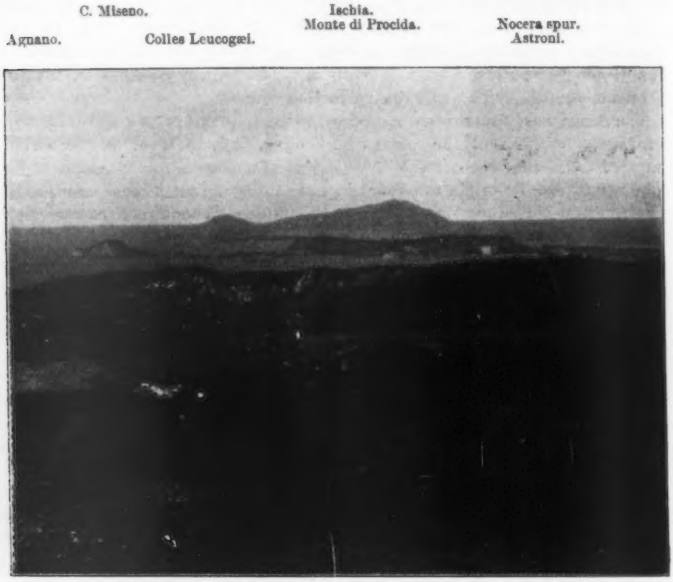

FIG. 9.—VIEW FROM CAMALDOLI OVER PART OF THE AGNANO PLAIN (TO THE LEFT), WITH THE WHITE COLLES LEUCOGÆI, AND THE CRATER OF ASTRONI (TO THE RIGHT). IN THE FOREGROUND IS THE PLAIN OF PIANURA.

circumference of the same circle; both are deeply furrowed by torrent beds, and to a far greater extent than the Astroni slopes. The slopes of the Nocera ridge are steeper to the east than to the west, indicating that the former are crater-slopes, the latter cone-slopes; and, finally, both lie on the site which the western crater wall of the Agnano crater, if reconstructed from its eastern and northern walls, might be expected to occupy (Map IV.).

For the crater of which these ridges—the Nocera and Lupara ridges—seem to be the surviving western walls, broken into both by Astroni and, at a probably later date, by the Solfatara, I propose the name of Archiagnano, in order to avoid confusion with any existing conceptions of the crater of Agnano having been merely coextensive with the former lake of Agnano.

If the theory stated above be the true one, the history of this interesting

group of volcanoes might have been somewhat as follows: First, the eruption of Archiagnano, with the formation of a crater wall which included the ridges of Nocera and Lupara, Monte Spina, and the hill to the west of the Masseria Grande; secondly, the shifting of the vent to the east, and the formation of the part of the crater occupied by the lake of Agnano; lastly, the eruption of Astroni and the Solfatara in the western wall.

17. *Cigliano.*

Between Astroni and Campiglione lies the extremely perfect cone and crater of Cigliano, which must be more recent than Campiglione, for otherwise it could hardly have withstood the waves which inflicted such damage on the flanks of the latter.

(*e.*) *Pacifico ridge.*

(*f.*) *Astroni-Cigliano ridge.*

(*g.*) *Crisci mound.*

Before leaving the Astroni group, there are three accumulations of volcanic *débris* which deserve notice, although I have been unable to account for their presence.

(1) The Pacifico ridge runs north-west from Astroni almost perpendicularly to a tangent at the point of intersection. If it originally continued further in the same line, it must have been cut across by the eruption of Archiagnano. It is covered superficially by trachytic lapilli from the Fossa Lupara eruption.

(2) The Astroni-Cigliano ridge—perhaps of no significance as an indication of a special crater wall, but merely a heap of *débris* from both craters.

(3) The Crisci mound—a small elevation of some 25 metres in height to the north of Cigliano. It may either be the summit of an old crater wall mostly buried by the *débris* erupted by other craters, or, as Deecke suggests, a portion of the southern wall of the Montagna Spaccata volcano.

18. *Quarto.*

The Camaldoli group includes the craters of *Quarto*, *Pianura*, and *Soccavo*. The hills and valleys of this group, together with those of the *Naples* volcano, are discussed in greater detail in a second paper to be published subsequently.

The most northerly part of the Phlegræan Fields is occupied by the large oval plain of the Quarto, completely surrounded by hills. It has yet to be determined whether the hills to the east and west are of the same age and originally due to the same eruption. However this may be, the Quarto is certainly not such a simple crater as has been supposed. The high eastern walls have every appearance of being crater-slopes much denuded by the torrents which have collected upon the high ground above. On the west the walls are much lower and have gentler slopes. On the north-west there is a broad, low ridge, which extends some distance into the plain. The southern walls—at any rate, in the neighbourhood of the Montagna Spaccata—seem to have been replaced by the ejecta from the latter volcano. At Monte Viticella and at Torre Poerio a similar change may be found to have taken place. Near the Campiglione, the cone-slope of Monte Corvara is continuous with the "crater-slope" (?) of that part of the Quarto.

The cone-slopes of the eastern Quarto are shared with those of the other volcanoes which have built up the Camaldoli massif.

19. *Pianura.*

Only one-half of the walls of Pianura are preserved. They attain their greatest elevation at Camaldoli, and are much eroded by torrents. The crater of Pianura is in very much the same stage of destruction as the crater of Nisida; their shapes are similar. There is geological evidence of the crater having been filled with a lake until tolerably recent times (Johnston-Lavis); now the surface water passes off into the adjoining Soccavo basin by a channel, which has been excavated at the foot of the Pignatiello spur to a depth of 45 feet below the level of the roadway.

20. *Soccavo.*

It is generally held that the Soccavo basin is the result of a volcanic eruption. If that be so, it seems to me that it cannot have contributed largely to the Camaldoli massif, because the contour-lines of the cone-slopes run concentrically with the circumference of Pianura, and not with that of Soccavo.

Lastly, there is the range of hills extending along a straight line from the Observatory hill at Capo-di-monte in a south-westerly direction as far as Nisida. From their disposition, it would seem as if the crust of the earth had given way to the volcanic forces along this line; and, further, that the foci of volcanic activity were not uniformly distributed all along the line, but were concentrated at points, two of which lay slightly to the south, and two to the north of the line. The two

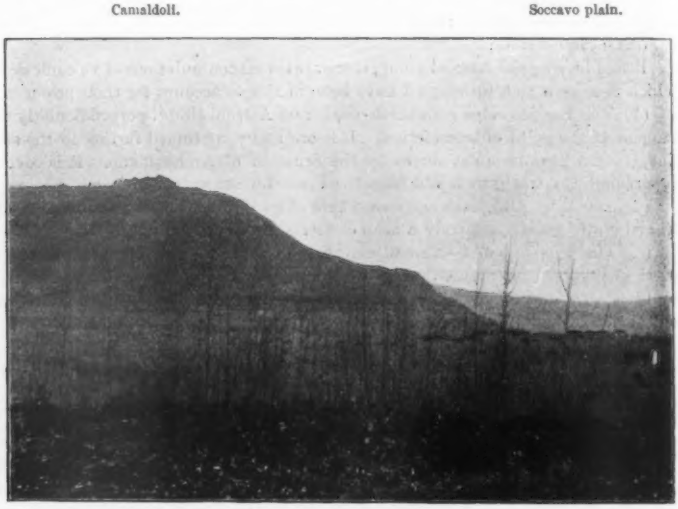

FIG. 10.—PIGNATIELLO SPUR BELOW CAMALDOLI.

lying to the south may be called *Naples* and *Chiaja;* the two to the north, *Fuorigrotta* and *San Strato;* and to these a fifth was added—*Nisida.*

Tunnels which have been excavated for the purpose of leading railways and sewers through the hills, have revealed masses of trachytic lava, such as are known to occur in other crater walls, *e.g.* Astroni, Solfatara.

21. *Naples.*

The old town of Naples lies at the foot of the semicircular range of hills, having all the appearance of a crater-slope, and extending from the Capodimonte Observatory to the hill of St. Elmo. The entire south-east half of the wall of the crater is wanting. The floor is perhaps conterminous with the slight elevation or plateau upon which the old Roman Neapolis stood. At the present day the southern margin of this plateau can be traced along a line from Sant' Agostino to the University building, where the fall is so steep as to necessitate the employment of steps as a means of placing the thoroughfares above in communication with those below.

The cone-slopes on the west are buried among the *débris* of the Camaldoli massif. In the south they become continuous with the Chiaja cone-slopes.

The course of the Vallone di Sagliscendi perhaps owes its present position to the Naples crater. The upper tributaries of this valley commence on the cone-slopes of the Pianura volcano. The valley skirts the north of the Soccavo crater, pursuing a westerly course; as soon as it reaches the spot where the cone-slopes of the Naples volcano might be supposed to be, it turns sharply to the north. Then once more it turns west, skirting the northern walls of the Naples volcano, and finally turning south it runs seawards to the east of Naples. The course of this valley certainly seems to afford some confirmatory evidence in favour of the theory that a volcano once existed where Naples lies now.

22. *Chiaja* (*Mergellina*, Jervis, 8).

Adjoining the bay in the hills identified above with the Naples volcano is a second, extending from the Castello dell' Ovo to the Sannazzaro spur, south of Mergellina. If this be the remains of a crater, its walls have been breached from the south, and two-thirds of its floor are submerged; the remaining third is occupied by the new western quarter of Naples between Mergellina and the Pizzofalcone ridge. On the east the cone-slopes become continuous with the cone-slopes of the Naples crater. In the angle between them, below Antignano, is a valley which discharges its waters into l'Arena, in the Soccavo plain. On the west the cone-slopes meet the crater-slopes of Fuorigrotta.

Posilipo ridge.

The sea horizon, as viewed from the Chiaja quarter of Naples, is closed in on the west by the beautiful ridge of Posilipo, extending for some 3½ miles from the Vomero. The uniform crest of the ridge lies near its western side, immediately above the steep slope which leads down to the Fuorigrotta and Bagnoli plains below. The incline of the eastern slopes commences more gradually, but ends more abruptly in the low cliffs which fringe and are being undermined by the sea.

23. *Fuorigrotta.*

At the northern end of the Posilipo ridge, and curving away from the sweep of hills already described as the crater-slope of the Chiaja volcano, lies another concave slope, open to the west, embracing the village of Fuorigrotta, and extending from the Torre Cervati spur below the Villa Patrizi to a second spur beneath the name "Monte di Dio" on the maps. If this slope be the crater-slope of a Fuorigrotta volcano, its northern wall is very probably indicated by the rampart which divides the low-lying Fuorigrotta plain from the higher level of the plain of Soccavo. It is partly, no doubt, owing to this sudden "step" between the levels of the two plains, that the watercourses which traverse the Soccavo plain have been excavated to their present depth.

There is also an indication of the western wall of the Fuorigrotta crater in the terrace on which stands the Masseria Terracina, at the foot of the cone-slopes of the San Domenico ridge, or eastern wall of Archiagnano. If this interpretation be the true one, the Fuorigrotta crater wall would seem to be older than that of Archiagnano, but not so old as that of the Soccavo crater.

24. *San Strato.*

Between the "Monte di Dio" spur and its termination in the Coroglio, the ridge of Posilipo has undergone so much denudation that it is difficult to discover any signs of a crater, even if it ever formed part of one. The hill, too, alters its character to some extent, for, whereas the western slopes retain the steepness which marks the crater-slopes of Fuorigrotta, the south-eastern slopes become far less steep from the ridge to the tops of the sea-worn cliffs. The width of the ridge becomes somewhat greater, reaching a maximum at the Capo. All along the south-

eastern slopes, at right angles to the line of the ridge, are a number of small valleys eroded by the torrents which scour their beds in wet weather, and which have co-operated with the sea in producing that charming succession of little bays (*cale*) to which this beautiful coast owes much of its picturesqueness. At Coroglio

Grotta dei Tuoni. Scoglio di Vergilio.

FIG. 11.—TUFA CLIFFS EAST OF THE CALA DI TRENTAREMI.

the ridge terminates abruptly. The cliffs extend the entire height of the ridge, and the rocks in the vicinity exhibit the marks and scars of many a battle with the sea. Several rocky islets lie below, detached from the mainland. The Gajola and the Lazzaretto vecchio rocks are inhabited; others, such as the Tavola di Mare, lie just awash with the surface of the water. The rate at which the land is being washed away might be estimated by an examination of the numerous ruins of Roman buildings still lining the shore.

From the analogy of undoubted crater walls, I am inclined to consider the western steep slope of the southern half of Posilipo as a crater-slope, the south-eastern one as a cone-slope, of a crater the centre of which lay in the Bagnoli plain, not far from the small volcanic hill of Santa Teresa.

25. *Santa Teresa.*

The Montagnella di Santa Teresa is a miniature horseshoe-shaped mound in the middle of the Bagnoli plain. Situated almost in the centre of the "crater of the San Strato volcano," it may be considered as representing the last expiring effort of volcanic activity in that region. It has been breached by the sea on the south.

26. *Nisida.*

Lying just off the south-west end of Posilipo is the island crater of Nisida. The sea has washed away a large portion of the south-western wall, and has opened the flooded crater towards the south so as to form a natural harbour. The western crater-slope of the Porto Paone is much steeper than the eastern. The cliffs, like those of the end of Posilipo and of Capo Miseno, rise vertically from the sea. Small fragments both of eastern and western walls have become detached as two islet rocks, known as the Guglia di Levante and Guglia di Ponente respectively.

Relative Ages of Volcanoes.

The only crater of known age is the Monte Nuovo. The others were formed in prehistoric times, and it seems almost impossible to form even a rough estimate of their absolute ages. On the other hand, there is often very considerable evidence that one volcanic structure is older than another. It may be that one does not exhibit such a weatherworn appearance as its neighbour, or that it has sprung up on the periphery of another, or, again, that its ejectamenta overlie those of a second volcano. These are taken as tests of relative age, and the following table has been constructed to exhibit the results obtained by such tests. In the

TABLE SHOWING SUPPOSED CHRONOLOGICAL ORDER OF FORMATION OF VOLCANOES OR

TABLE SHOWING SUPPOSED CHRONOLOGICAL ORDER OF FORMATION OF VOLCANOES OF PHLEGRÆAN FIELDS.

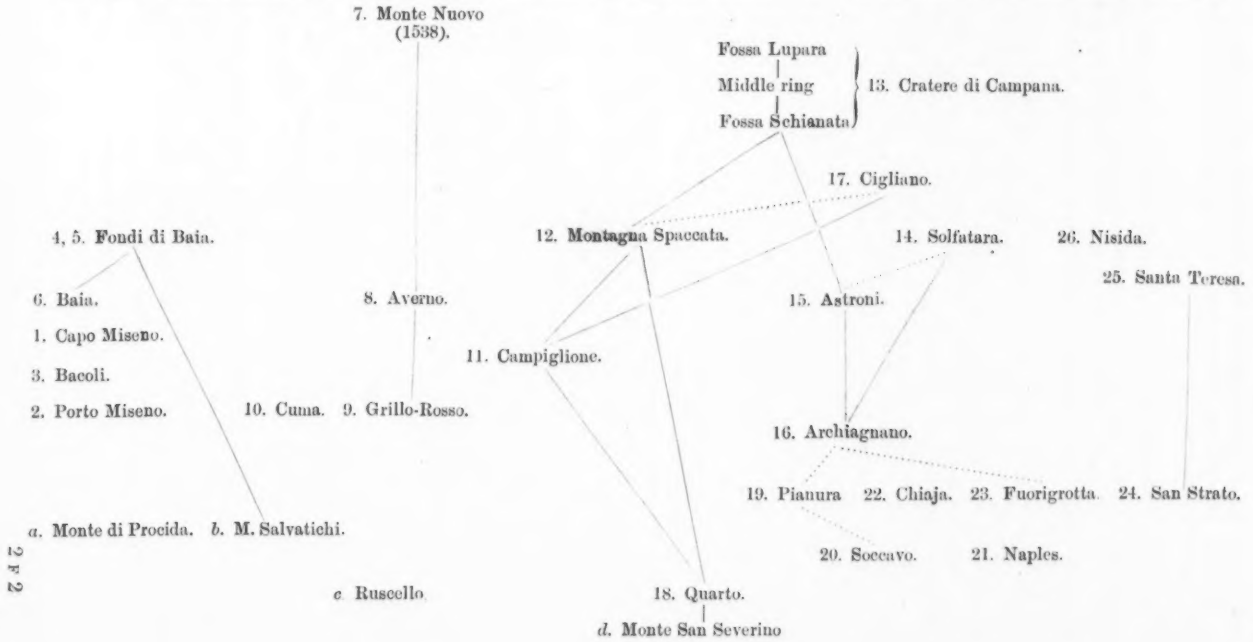

table the younger structures are arranged above those which are considered to be older. The lines connect those between which it is thought that some evidence of relative age can be detected.

Conclusions.

In conclusion, it has been shown that almost all the hills in the Phlegræan fields are either the entire walls of volcanic craters or portions of walls of volcanic craters which have been, to a greater or less extent, washed away by the action of rain or the sea, or have been partially destroyed or buried by more recent volcanic eruptions.

Secondly, these volcanic craters are distributed over a crescentic area round the bay of Pozzuoli; the more recent ones are situated closer to the shore of the bay than the older ones, indicating a gradual march of volcanic vents along lines radiating towards the centre of that bay. In other words, the general effect of volcanic activity has been the accumulation of new land around the bay of Pozzuoli. Inasmuch as water seems to be a necessity for a volcanic eruption, this progression of the volcanoes seawards may stand in some relation to the channels by which water has obtained access to the fires below.

Thirdly, wherever crater rings of a larger and smaller diameter overlap, we never find a larger ring superimposed on a smaller one. The smaller ring always is superimposed on the larger. The conclusion to be drawn is, that the volcanic activity of the region has been decreasing in intensity. The same proposition is proved for a single locality by the Campana series of craters.

Lastly, considering the amount of attention that has been paid to the Phlegræan fields by geologists, mineralogists, and travellers, it is a matter of surprise that our knowledge concerning much of the region is so incomplete. Apparently the interest of the more perfect and still active manifestations of volcanic energy in the vicinity have so entirely absorbed the attention of visitors, no less than that of the residents, that they have not been able to study the less perfect, dead, and partly buried ruins of the older craters as fully as they deserve.

One subject which I should like to suggest for future investigation is the exact configuration of the sea-bottom, especially in the vicinity of the banks which rise up at several places near the coast. A series of soundings taken close together in the neighbourhood of some of these banks might reveal the existence of curved crater-like hills on the sea-bottom, very similar to those on the land. Attention has been drawn to the bar which closes the Porto Miseno, itself probably the surviving eastern wall of that crater.

The ruin-covered shoal named *Fumosa* may perhaps indicate the southern wall of a crater on the site of Lago Lucrino. The Mezzogiorno bank may be a submarine crater wall south of Capo Misenum, and the Benda Palummo banks, rising up to 23 and 27 fathoms, with a depth of 34 fathoms between them, represent a condition not unlike that of the Campiglione, were it submerged to the same depth. La Catena and many other shoals round about Procida and Ischia would be well worth a careful survey.

I have, so far as possible, reviewed the region from a purely morphographical standpoint, studying its features in their purely topographical aspect, consequently my conclusions must be regarded as suggestive rather than as final. Their ultimate proof or disproof rests with the geologist, and if they stimulate him to extend his researches, my labour will not have been in vain.

APPENDIX A.

List of Mineral Springs, Fumaroles, and Mofette.

Names of springs, baths, etc., in use in or before the sixteenth century are printed in italics.

During the fifteenth and sixteenth centuries, and even earlier, the Phlegræan Fields were celebrated for the number, variety, and excellence of their natural hydropathic establishments. If we may trust the writings of contemporary physicians, there was no ailment but had its appropriate remedial waters and baths in this favoured country. Michael, the grandfather of Savonarola, followed by Bartholomæus Taurinensis and a number of other writers, has described, and Alcadinus has sung, the medicinal virtues of the mineral springs. The height of their fame was reached in 1668, when the Spanish viceroy, Pietro Antonio d'Aragona, made the baths more accessible, and caused three tablets to be inscribed with a descriptive directory to the baths. The first of these guide-inscriptions was placed at the entrance of the Grotta di Posilipo, the second in the Piazza di Pedro di Toledo in Pozzuoli, and the third near the Sudatoria di Tritoli. For further information the curious reader was referred to the works of Sebastiano Bartolo.

Lago Fusaro.—Fish are said to have been killed by gaseous emanations during the eruption of Vesuvius in 1834 (Daubeny).

Monterillo. Fumarole.

Miseno.—Grotta del zolfo, north of Porto Miseno. Fumarole depositing salts and sulphur.

Finocchio. Fumarole. *Balneum Fœniculi* (Elysius).

Baia.—Numerous warm springs occur along the coast between Baia and the Stufe di Nerone. During the sixteenth century the following baths were used for medicinal purposes: *Bagni di Spelunca, di Braccola* (near the Truglio), *delle Fati, del' Vescovo* (= *balneum Fontis Episcopi*), *di Gibboroso, acque di Culina* (= *balneum Culmæ*), *acque del Sole e della Luna* (= *balneum Cæsaris* of Alcadinus).

Stufe di Nerone (= *Sudatorium Trituli*, auct.).—Fumaroles and spring of hot water. When the railway tunnel was driven through the hill, many Roman cuniculi were encountered. Some were traced for 100 metres. They were probably used for collecting vapour for sudatoria (Johnstone-Lavis). Close at hand were the baths called *Salviana* (= *balneum Sylvianæ*), *di Tritoli, di S. Giorgio* (= *balneum S. Gregorii*), *del Petroleo*, and *l'acque di Pugillo*. At one place in the vicinity the temperature of the sea-water was found to be 55° C. or 131° Fahr. (Schmidt).

Monte Nuovo.—One fumarole, "fumeta di travi di fuoco," is in the middle of the south-west slope; another is on the western side. The *bagni di Tripergole, del Arco, di Rainiero, di San Nicola, della Scrofa, di S. Lucia, di S. Maria, di S. Croce* are said to have been buried beneath the mountain.

Lago Avernus.—The Sibyl's Cave, with its ancient *bagno Palombara*, or *bagno della Sibilla* and the *bagni di Succellario* and *del Ferro*, were all situated close to the lake. The Acqua Capona still rises in the temple of Apollo.

Cratere di Campana.—Fumaroles (extinct) a few yards to the north of the Grotta di Pollicino (Deecke).

Pozzuoli.—Temple of Serapis. Acqua dell' Antro and Acqua della Macchina, warm waters containing carbonates, sulphates, and chlorides of sodium and calcium, magnesium carbonate and chloride, iron carbonate, aluminium chloride. Acqua dei Lipposi and Acqua Media are cold springs of similar composition.

Bagni Cantarelli, Fontana, del Prato (= *balneum Ciceronis*). The hot springs

of the *Bagno Ortodonico*, in the grounds of the Villa Cardito, were flowing in 1697 (Sarnelli).

Solfatara.—Fumaroles depositing sulphur, ammonium chloride, and arsenic sulphide. *Balneum Sulphatariæ seu Fori Vulcani.*

The Pisciarelli flowing from the Colles Leucogaei were once rich in alum. The annual output of alum salts was valued at 20,000 sesterces (£160) at the time of Augustus (Pliny, 18, 29). Some recent borings to a depth of 25 metres, undertaken to rediscover the old alum water, only encountered sulphureous springs. For the results of Dr. Cirillo's analysis, made in the latter half of the last century, see Hamilton, Explanation of Pl. xxi. The *Aqua Bullæ* was famed for its medicinal properties in the fifteenth century (Savonarola). It used to contain sulphate of lime, alum, iron, sulphurous acid, and sulphuretted hydrogen.

Astroni.—Acque degli Astruni (= *Balneum Aquæ Strumæ*, Ugolinus) are said to have been warm and sulphureous.

Lago Agnano.—Streams of bubbles of almost pure carbonic acid gas used to rise through the water before the lake was run off in 1870 (Deville). The older authors, Savonarola, Elisio, etc., comment upon the absence of fish, and upon the abundance of frogs and serpents.

Grotta del Cane. Warm carbonic acid gas mofette.

Grotto d'Ammoniaco. Carbonic acid gas mofette.

Stufe di San Germano, or di San Giacomo (= *Balneum siccum, seu sudatorium S. Germani*). Carbonic acid gas and sulphuretted hydrogen. The gas from the different orifices differs much in composition (Deville).

Bagnoli.—There are many warm springs between the end of Posilipo and Pozzuoli. The name Terme explains itself. Bagnoli takes its name from mineral baths containing sodium carbonate, sulphate, and chloride, as well as free carbonic acid gas.

Acqua di Subveni homini contains more sodium chloride than the waters at Bagnoli, and also chlorides of calcium and magnesium. In the sixteenth century the chief medicinal springs were the *balneum foris Cryptæ*, near Posilipo; *balneum Juncaræ*, *balneum Plagæ* (=*bagno di Bagnoli*); *balneum Petræ* and *balneum Calaturæ*, beneath Monte Olibano; *bagno di Souvieni huomini* (= *Zuppa d'Huomini*), *bagno di S. Anastasia* (=*balneum Arenæ*), and *bagno dell' Adjutorio.*

Fuorigrotta.—*Balneum de Tripta* (Savonarola) (=*bagno di fuori Grotte*, Capaccio).

Naples.—Santa Lucia (Acqua Solfurea). A sulphureous spring with carbonic acid gas.

Castello del' Ovo (Acqua ferrata di Pizzo-falcone). A ferrugineous spring with large quantities of free carbonic acid gas.

Palazzo Reale. An artesian well producing water containing much carbonic acid gas, salts of iron and magnesium, and calcium carbonate.

APPENDIX B.

List of Trachytic Rock Masses and Lava-streams.

Monte di Procida.—α. At bases of two headlands, one to the north, and the other just opposite the Scoglio di S. Martino.

β. Punta di Torre Fuma.

γ. Pietre nere, or Schiavone.

Monte Nuovo.—Lava-stream on south cone-slope.

Monte di Cuma.—α. Trachyte foundation, 20 metres thick.

β. Layer of vitreous trachyte, 1 metre thick, above a grey tuff.

Cratere di Campana.—α. Trachytic mass on east of Fossa Lupara, which has been rent asunder to form the Senga.

β.—A lava-stream on north-west side of middle crater wall (Scacchi).

Monte Corvara.—A lava-stream is indicated on north-east slopes near the Montagna Spaccata, in a model constructed for the South Kensington Museum by Amedeo Aureli. It has not been seen by the author.

Astroni.—α. The crater is plugged by trachyte, which rises to form the two mounds known as the Rotondella and l'Imperatrice.

β. Trachytic dyke in east wall of crater.

Solfatara.—Trachyte appears in at least three places in the floor of the crater, as a large mass in the south wall, and also on the slopes of the Colles Leucogæi.

Monte Olibano.—Trachytic boss.

Monte Spina.—Vein of Trachyte on north side.

Naples.—α. Trachytic mass near S. Maria del Pianto (Roth).

β. Trachytic mass at Fontanelle, recorded by Breislak.

γ. Great thicknesses of trachyte are traversed by the tunnels of the Colletori Pluviali delle Colline and of the Ferrovia Cumana, under the Corso Vittorio Emanuele and Via Tasso.

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(*To be continued.*)

THE MONTHLY RECORD.

EUROPE.

The Sale of Ordnance Maps.—A parliamentary paper has lately been issued relative to the sale of Ordnance maps, which shows that by recent arrangements the facilities given to the public for obtaining maps at various towns throughout the country have been greatly increased. Mr. E. Stanford still remains the sole agent for the sale of Ordnance maps within the county of London, while for the cities of Edinburgh and Dublin Messrs. J. Menzies & Co. and Messrs. Hodges, Figgis & Co. have been appointed agents respectively. Agencies have also been instituted from January 1, 1897, in a number of other towns throughout the United Kingdom, and arrangements have been made whereby orders can be given at the head post offices of many other towns at which there is no agent. The agents throughout the country are bound to keep at the respective depôts "such a stock of the Ordnance Survey maps, with the relative area books, and of the index maps and catalogues, as may be, in the opinion of the Board of Agriculture, sufficient to meet the ordinary calls made upon them;" and it is further specified, in the case of London and Edinburgh, that "the agent shall keep at least one copy of every Ordnance Survey map (of England and Wales and Scotland respectively), whether coloured or uncoloured, which shall not have been superseded by a later edition." The selling prices are fixed by the Board, and are not to be exceeded by the agents; facilities are also to be given for the exchange of any map purchased by mistake for another, provided it be returned promptly and in good condition, and another taken. As the agents appointed already number nearly 140, the advantages to the public of the new system are at once apparent.

The Eifel Maare.—In continuation of his limnological studies in Germany (see *Journal*, vol. vii. pp. 198, 199, vol. viii. p. 634), Dr. Wilhelm Halbfass contributes to the July number of *Petermanns Mitteilungen* the results of his observations on the Eifel Maare. Geologically, these small lakes, eight in number, exclusive of a very small one which is on the point of being obliterated by the growth of reedy vegetation, are universally recognized as filling the craters of volcanoes which came to an end in the first stage of their activity. They are mostly somewhat round in shape, with an increase in depth from the margin to a point in or very near the middle. The following table gives in English measures the main results of the observations of Dr. Halbfass:—

Name.	Greatest Length.	Greatest Breadth.	Circumference.	Depth in feet. Maximum.	Depth in feet. Average.	Height of surface above sea-level.	Area.	Volume, millions of cubic feet.
	Miles.	Miles.	Miles.			Feet.	Sq. mile.	
Laacher See	1·46	1·16	4·58	174	107·0	902	1·278	3367
Pulver Maar	0·42	0·40	1·40	243	123·0	1358	0·135	412
Meerfelder Maar	0·47	0·28	1·24	56	27·6	1097	0·093	64
Holzmaar	0·20	0·16	0·68	69	31·2	1419	0·026	20
Ulmener Maar	0·20	0·14	0·57	121	60·0	1377	0·021	31
Weinfelder Maar	0·33	0·23	0·95	167	84·3	1571	0·061	135
Gemündener Maar ...	0·20	0·19	0·61	125	60·7	1328	0·028	42
Schalkenmehrer Maar ...	0·36	0·31	1·10	69	37·4	1386	0·083	77

ASIA.

Ptolemy's Geography of Indo-China.—Mr. G. E. Gerini, who has for some years devoted his attention to the elucidation of Ptolemy's statements

regarding the geography of the Trans-Gangetic India—a task in which previous commentators have met with slight success—contributes a paper on the preliminary results of his researches to the July number of the *Journal of the Royal Asiatic Society*. Although these results are as yet imperfect, owing partly to the difficulties in which the writer has been placed through want of access to the complete literature of the subject, he has done enough, if his conclusions are to be relied on, to shed a new and in many ways unexpected light on the difficult question of the knowledge of the far East possessed by the ancients. The methods previously adopted have failed, Mr. Gerini thinks, through being too theoretical on the one hand and too empiric on the other. The attempt to find a formula of correction applicable alike to the better known and to the outlying parts of the world must fail, considering the greater imperfection of data necessarily existing in the case of the latter, while the method of identifying Ptolemy's places merely by a comparison with modern names is evidently faulty. Mr. Gerini's method depends on the identification, by a study of old records giving information regarding the marts and emporiums of trade on the coasts in question in Ptolemy's time, of one or more of the latter's stations, in order to supply a basis for the determination of his amount of error in the regions beyond the Ganges. The first stations thus identified were Ptolemy's *Akadra* and *Pithonobaste*, which, according to Mr. Gerini, correspond with the Bay of Ka-Dran (the present Hatíen) and Panthai-Mas on the Kambojan coast of the Gulf of Siam. The formulæ of correction obtained from these and other positions, when applied to Ptolemy's co-ordinates, give remarkable results, which lead the writer to the conclusion that Ptolemy's geography of the India extra-Gangem is still capable of fairly accurate interpretation, and presents perhaps fewer difficulties than the Cis-Gangetic portion. An interesting identification supplied by the method adopted is that of Ptolemy's "Stone Tower" with Khoten, while by swinging round the farther coast-line of the "Magnus Sinus" on the Lui-chau peninsula as a pivot, the writer is able to identify all its chief features with features bearing similar names on the coast of China. Mr. Gerini thinks that his researches will throw much new light on the trade relations of the ancients and the early routes of commerce in the East.

The Yakuts.*—The work under the above title, which has lately been published by the Russian Geographical Society, is a splendid addition to the geographical literature of Northern Siberia. The author, V. L. Sieroszewski, was a political exile, who was sent, in 1880, by order of the administration, to be settled at the pole of cold of the eastern continent, Verkhoyansk, a village consisting of a score of houses. There he was kept for three years, and, owing to a certain leniency on the part of the local police officer, was allowed to descend the Yana river to its mouth, there being evidently no danger of escape in those unpopulated icy deserts. In 1883 he was transferred further east, to Sredne-Kolymsk, on the Kolyma river; and in 1885 was allowed to go to the capital of those desert regions, Yakutsk. Thence he was transferred to a still remoter spot, on the Aldan river, and in 1887 to the Nama Yakut village in that same district. There he carried on agriculture up till 1892, when, the term of his twelve years' exile being over, he was allowed to settle in Irkutsk. In this town he spent eighteen months working in the library of the Siberian Geographical Society, and an Irkutsk lady, Madame Gromova, the head of a firm of traders in Yakutsk, volunteered to pay the costs of publication of the remarkable

* 'The Yakuts: An Attempt at an Ethnographical Description.' By V. L. Sieroszewski. Published by the Russian Geographical Society, under the supervision of Prof. Veselovsky, with the aid of a grant from A. I. Gromova. Vol. i. St. Petersburg: 1896. (168 illustrations, portrait of Middendorff, and map.)

ethnographical materials which V. L. Sieroszewski had collected during his peregrinations. The Russian Geographical Society at St. Petersburg undertook to edit that work; while Baron Toll, the meteorologist E. W. Stelling, and the botanists S. I. Korszinski and J. P. Prein undertook to read over the manuscript. The result is now a handsome octavo volume, with a map and 168 excellent photographs and drawings, which were made by three Russian artists from the author's sketches. This work is a real mine of trustworthy and digested information about the nature and the inhabitants of the region. It is very well written, with an excellent sense of proportion, and with full knowledge of the excellent works of Middendorff, Maack, and other previous explorers; some parts of it, especially those which deal with the climate and the vegetation, are fine specimens of geographical literature, every page containing some little detail eminently characteristic of the nature of those dreary regions. After a rather too short geographical sketch of the country, the climate, the vegetation, and the fauna, as well as the domestic animals of the Yakuts, are described (180 pages). The remainder of the book (700 pages) is given to ethnography. By analyzing the folk-lore of the Yakuts (for which, besides the author's own notes, excellent materials are found in the little work of the great explorer of Russian folk-lore, Khudyakoff, who also lived many years as an exile in the same region and died there, his materials having been published after his death by the Siberian Geographical Society)—by analyzing that folk-lore, as well as the traditions as to the climate of their former abodes, the names of such animals as do not occur in the present abodes of the Yakuts, their calendar, and so on, the author shows that they must have come from the south, and very probably from the south-west. He then discusses their gradual spreading, and their physical features, as well as the admixture among the present Yakuts of Mongol, Manchurian, Tungus, and Russian blood. Most of this was, of course, already known, especially through Middendorff's capital work, but even this chapter contains many interesting new details. The economical foundations of Yakut life, their food, their dress, and their arts, as well as the conditions of work (wage-work, association, hiring of cattle, etc.), are described. A very interesting chapter, full of new and well-interpreted information, is then devoted to the clan organization, ancient and modern, to the present village community, to family relations, to the children, their treatment, and their games, and finally to marriage and love. The two last chapters are given to folk-lore, various recently published materials having been taken into account. The wealth of information contained in this volume appears at once from the above enumeration, and again the regret must be expressed that this work, like scores of others, which would be excellent reading for wide circles, remains unknown in Western Europe, even in abridged editions. The map which is appended to this work gives the distribution of all the present clans, while the drawings and photographs admirably illustrate the text.

A Journey in Southern Arabia.*—Although the journey described by Herr Hirsch in his recently published work was made more than three years ago, so little has been written, or is in fact known, concerning the interior of Southern Arabia, that the appearance of the book is welcome, as supplying detailed information with regard to a small portion at least of that interesting country. The principal journey made by the German traveller—in fact, the only one which took him into the interior of the country—coincided very closely with the route of the late Mr. Bent to the Upper Hadramut valley in 1894, *i.e.* just a year later, and as it was described in outline by Herr Hirsch himself in the third volume of the

* Leo Hirsch, 'Reisen in Süd-Arabien, Mahraland und Hadramut.' Leiden Brill. 1897.

Journal (p. 196), it is unnecessary to go into detail here. The book is kept within moderate compass, and forms a consecutive narrative of the traveller's experiences, containing also many details as to the physical features of the country along the route. Frequent readings of the barometer and thermometer were taken, but would have been more useful if recorded in a table at the end, than interspersed, as is the case, with other matter in the body of the book. A list of the plants collected, numbering in all over one hundred and sixty species, and including one new genus and a fair proportion of new species, is given as an appendix. It shows that, if scanty, the flora of this part of Arabia is not wanting in interest. The features of the country immediately adjoining the route are shown on a map of the scale of 1 : 800,000. It may be remarked that the latitudes in the Upper Hadramut valley differ by considerably over half a degree from those given in the sketch-map accompanying Mr. Bent's paper, although these were checked by astronomical observations with the theodolite.

Termination of the Lyonese Mission in China.—M. Brenier, the chief of the French Commercial Mission which during the past two years has traversed the western and southern provinces of China in various directions, reached Macao in June last, accompanied by Dr. Deblenne, thus bringing to a close the task entrusted to him. Owing to a rebellion which had taken place in the north-west of Kwang-si, and which the mandarins seemed powerless to cope with, the travellers had been obliged to make a long *détour* by way of Kwei-yang, the capital of the province of Kwei-chou, in order to reach Canton. Accounts of the journeys of various sections of the mission continue to appear in the *Tour du Monde*.

AFRICA.

Geographical Results of the Bòttego Expedition.—The publication in the ninth number of the *Bolletino* of the Italian Geographical Society (1897) of a preliminary report by Lieuts. Vannutelli and Citerni on the geographical results of Captain Bòttego's last expedition, accompanied by a sketch-map of the routes followed, enables us to add some details to those given in the last number of the *Journal*, and to gauge with more precision the value of the work accomplished, which, taken in conjunction with Captain Bòttego's previous work of exploration on the upper Jub, entitles the deceased officer to a very high rank among the modern explorers of Africa. In spite of the many travellers who have sought to unravel the geography of the southern Ethiopian highlands, a number of problems still clustered round the tract of country lying north of Lake Rudolf, all of which have now been solved, in their broad outlines, by the latest Italian expedition to that region. The much-vexed question of the course of the Omo has been settled, the western shore of Lake Rudolf explored, and the general hydrographic features of the Sobat system, the last of the Nile tributaries awaiting discovery, have been defined. In addition to this, a new lake of considerable size has been discovered, apparently forming a fresh link in the lacustrine chain which stretches throughout the whole of East Africa towards the shores of the Red Sea. It appears to be this lake which, under the name Abba, or one of its variants (all of which are used generically for any large mass of water), has been so long vaguely indicated on our maps as existing in the region south of Shoa. The Italian travellers found its true name to be Pagade,* and, having entirely compassed its shores, are able to delineate it with some precision. It is described as of great beauty, and contains twelve islands, all inhabited and cultivated. Its length is about 95 miles, and from the north it receives the waters of a mountainous region, which appears to separate its

* They have, however, christened it afresh—"Regina Margherita."

basin from that of Lake Zuai. It sends a short effluent southwards into the lake Abbaya of Prince Ruspoli and Dr. Donaldson Smith (called by the Italian travellers Chiamo); but, contrary to the statement of the latter traveller, this lake is said not to have any connection with the Sagan or Galana Amara which flows into Lake Stefanie. From Lake Pagade the expedition made its way to the Omo, which after all proves to be identical with the Nianam, the principal feeder of Lake Rudolf. Its valley is very narrow and enclosed by high mountain walls, a fact which accounts for Dr. Smith's inability to discover a break in the hills from his view-point in the south. The small volume of water possessed by the stream ascended by him is explained by the fact that, during the latter part of his northerly excursion, he must have been following a tributary instead of the main stream, which makes a wide bend to the south-west. The river Bass of Count Teleki is represented by a stream which loses itself in a marsh near the north-west corner of Lake Rudolf, its water only finding its way to the lake by infiltration. The western shore of the latter was followed as far as the mouth of the Tirgol, the point reached by Teleki and von Höhnel from the south, not a single stream apparently entering the lake during this distance. The survey of this western shore proved that the width is less than has been shown on previous maps. The Sobat basin was first reached slightly to the north of 6° N.; a southern branch, the Juba, being followed downwards for some distance across plains of rich grass. The expedition then struck across to the Upeno, the principal branch of the Sobat, crossing on the way the Shelo, which flows through a small lake. The Upeno has a breadth of over 300 yards at low water, but is shallow. It appears to be formed by the junction of the Baro and Birbir, the latter rising in the north-east, near the course of the Didessa.

Consular Reports for 1896.—Reporting on the trade of Tripoli, Mr. Dickson records a general state of stagnation, although both imports from and exports to Great Britain show a slight increase, the demands for British cloths having somewhat improved. Italian shipping, however, maintains its predominant position. The hoped-for re-opening of the caravan route to Bornu has not taken place, owing to the attitude of the Tuareg, and the hostilities between Rabah and the Emperor of Sokoto. From Harrar, Mr. Rodd calls attention to the general complaint of want of substance in the cottons, etc., supplied from England. A better quality would meet with a good sale. The Zeila route is still preferred to that from Jibuti, being shorter, easier, and more secure. The report by Mr. R. Casement on the trade of Lourenço Marques shows a considerable extension of the import trade, practically the only branch represented, and almost entirely one of transit to the Transvaal. The trade with that country *viâ* Dolagoa bay shows (in 1896) an increase of 113 per cent. (fairly well distributed over the separate items), as compared with increases of 16 and 205 per cent. respectively *viâ* Cape Colony and Natal. The large imports of food stuffs prove the disregard for agriculture due to the gold fever. Butter forms a considerable item, and might well, Mr. Casement suggests, be supplied by Ireland. England still holds the market for the better qualities of cottons and woollens, but inferior kinds are largely supplied from the continent. British shipping, except in the item of passenger traffic, still maintains a favourable position, and the important future of the port is generally recognized. The report on Zanzibar trade for 1896, by Mr. Cornish, records a falling off in the total amount as compared with 1896, due, it is thought, to the plague at Bombay and the decline in the price of cloves, the quantity exported being very much less in 1896 than in either of the two preceding years. A short crop is also feared for the present season. Great Britain takes the lead both for imports and exports, and a satisfactory increase in the import of piece goods is recorded; but here, as elsewhere, the sizing in the English cloths is complained of. The exports to British

East Africa show an increase, and Zanzibar, it is said, is becoming more and more the chief centre of commerce in East Africa. From Chinde a large increase in the local trade between the Indian traders and the natives is reported, but the shipping returns are very little different from those of the preceding year. Regular lines of steamers to this port are promised, both by the Castle Line and the *Messageries Maritimes*. Damage continues to be done by the encroachments of the river. Mr. Alfred Sharpe's report on British Central Africa records satisfactory progress in the general condition of the Protectorate. Since the successful termination of the Angoni war, peace has everywhere prevailed. The imports show a slight decrease, but the exports a considerable increase in spite of a diminution in the amount of ivory. The value of coffee exported increased by over £9000 as compared with the previous year. The unusually high level of Lake Nyasa has rendered the Shire river channel navigable all the year round, and two new steamers placed on it by the African Lakes Corporation have proved a great success. A new vessel, far larger than any at present on Nyasa, is under construction for that lake. The use of British currency has largely increased throughout the Protectorate, and rupees are now hardly seen. Native labour is very plentiful. Mr. Pickersgill, in discussing the trade of the Congo State for the past year, considers that there is no great development to record, the apparent increase in imports being not due to an extensive trade in the way of barter, but rather to the introduction of goods for the requirements of the Government, missions, etc. It may, therefore, be regarded in the light of outlay for the improvement of an estate. Ivory and indiarubber are the only paying products of the interior. The duties on these yield a considerable revenue, and there is no reason to fear a rapid exhaustion of the supply, but large capital is required to ensure success in trading ventures beyond Stanley pool.

Trigonometrical Survey of British South Africa.—We are informed by the directors of the British South Africa Company that the Administrative Council at Salisbury resolved in March last that a trigonometrical survey of the territory should be carried out in accordance with a plan suggested by Dr. Gill, Her Majesty's astronomer at the Cape. This is briefly as follows: Chains, 15 to 20 miles broad, of very accurate single triangles, would be carried across the country along certain lines, the principal being one from Tati through Bulawayo and Salisbury, and beyond the latter in the direction of Blantyre as far as circumstances should require, and another along the thirty-first meridian from Victoria to Salisbury, with north and south extensions. Loops of cheaper triangulation, beginning and ending on these chains, could include all the more important parts of Rhodesia.

Hydrography of the Sanga River, Congo Basin.—The opinion of M. Wauters that the Goko, or Ngoko, usually put down as a western tributary of the Sanga, may prove to be the principal branch of the river, has already been referred to in the *Journal* (vol. viii. p. 552). His view appears to be supported by M. Lemaitre, an agent of the *Société Belge du haut Congo*, who is well acquainted with the lower course of both branches (*Mouvement Géographique*, 1897, No. 24). He states that articles of English manufacture, some bearing the stamp of the Royal Niger Company, are seen in some numbers on the Goko, while very few comparatively are met with on the Sanga. He is therefore, like M. Wauters, inclined to identify the Goko with the Lom, crossed by Mizon in the south of Adamaua. The Ja, seen near its source by Crampel in 1888, he considers to have a parallel course with the Goko. The Eastern Likuala is of less importance than some travellers have supposed. East of the Sanga, M. Lemaitre heard of an important trade centre named Lubi, on a river which, from the native accounts, would seem to be the upper course of the Ibenga, a tributary of the Ubangi.

The Climate of the Congo.—At a hygienic congress held early in August at Brussels, under the presidency of Dr. Kuborn, many points relating to the means of improving the health of Europeans on the Congo were discussed. While acknowledging that complete acclimatization is impossible, most of the speakers laid stress on the possibility of diminishing the death-roll of Europeans by strict attention to the rules of hygiene, the want of which is accountable for a large proportion of the deaths. In fact, a distinct improvement has already been disclosed by statistics. The examples of India, Java, and even of Belgium itself, show what may be done in time in this direction, while even now the mortality on the Congo is less than in the Cameroons, the Niger, or Cochin-China. The northern races of Europe have shown themselves no less capable of adaptation to the climate than the southern, the important factors being, not race, but temperament and good housing and nourishment. Even the negroes, though content with a vegetable diet when living at ease, require more supporting food when performing severe labour. The Congo railway, it was remarked, is likely to have a beneficial result in facilitating the procuring of supplies. It was recommended by more than one speaker that, as a general rule, two years should be the limit of continuous service on the Congo.

M. Eysseric's Journey in the Interior of the French Ivory Coast.—Early in the present year M. Eysseric started from the French Ivory Coast on a journey of exploration in the little-known western districts in the interior of the colony. A brief outline of the journey, from which the traveller has now returned, appears in the *Comptes Rendus* of the Paris Geographical Society (1897, p. 262). M. Eysseric's plan was to ascend the western branch of the Bandama river (known as the Red Bandama), and make his way westwards to the Kavalli, which forms the boundary between French territory and Liberia. This programme he was unable to carry out completely, owing to the hostility of the natives; but he executed a survey of the Red Bandama, and returned to the coast through the mountainous district of Kami, said to be rich in gold. His survey was checked by a considerable number of astronomical observations.

AMERICA.

Climates in Davis Bay and Baffin Bay.—Mr. Ralph S. Tarr, a member of the Peary Greenland Expedition, contributes a paper to the *American Journal of Science* on some points connected with the marked difference in climate observed on the two sides of the sea separating Greenland from the American coasts. The name "Davis bay," it should be stated, is proposed for the innominate area extending from the main Atlantic to Davis straits. The author journeyed along the Labrador and Baffin Land coasts during the summer of 1896, travelling northward late in July and southward early in September, and spending the intervening period on the Greenland coast, where he reached 74° 15′ N. lat. His observations are concerned with tracing the effects of prevailing winds and ocean currents in the distribution of the ice, and from these he is led to speculate on the relations of changes of level in the land to past and present glaciation. The main point it is desired to establish is that the climatic conditions of Baffin Land and Labrador are "wonderfully near those which produce glaciation." Without predicting that those regions are about to re-enter a glacial period, he considers it safe to say that if the elevation now in progress continues, the time is not far distant when valley glaciers will again appear in the Labrador peninsula, and when those of Baffin Land will increase in extent, and this would, of course, be a great step towards the re-establishment of a general ice-sheet. On the Greenland side there is distinct evidence that a subsidence of the land is going on, and that the ice-front of the Greenland glacier

is retreating; this is especially noticeable in the Upper Nugsuak peninsula. These observations—like those of Gregory in Spitsbergen—are of the greatest geological interest in explaining the details of the processes of erosive action under their most active conditions. Mr. Tarr's suggestions as to the possible balancing action of the mere weight of ice producing elevation and subsidence, and adjusting itself automatically by the variations of temperature due to changes of level, are valuable in connection with some of the recent observations in the Mississippi basin, and indicate opportunities of further investigation. But the main facts seem still the subject of considerable disagreement amongst American geologists.

Ascent of Mount St. Elias.—The ascent of Mount St. Elias has been accomplished by the Italian expedition under Prince Luigi Amadio (*ante*, p. 214). The foot of the mountain having been reached after thirty-eight days' hard travelling, during which the members of Mr. Bryant's party were met returning from an unsuccessful attempt on the mountain, the ascent was begun on July 30. A height of over 12,000 feet was reached on that day, and the ascent completed on July 31, the effects of the rarefied air being severely felt. The height of the mountain was found (by mercurial barometer) to be 18,060 feet, a result which agrees remarkably with the estimate of Prof. Russell. The statement of that observer that the mountain is not volcanic in origin, has been fully confirmed.

Recent Explorations in Bolivia and Peru.—Through the kindness of our honorary corresponding member, Señor Ballivian of La Paz, we have received an official report by Colonel Muños, in which that officer describes the explorations made by him, between 1893 and 1896, in North-Eastern Bolivia, mainly for the examination of the navigability of the rivers of that region. The Madidi, a western tributary of the Beni, was first ascended, but it proved impossible to advance within sight of the cordillera, the whole country, as far as the highest point reached, maintaining the character of a plain. The course was extremely sinuous, but it is always navigable for small craft. While holding that the Madidi undoubtedly rises in the eastern cordillera of the Andes, Colonel Muños says that it is not the continuation of the Tambopata, as has been usually shown on our maps, but of some other stream which rises in the sierra of Caupolican. The Tambopata continues its northerly course to the Madre de Dios, which, says Colonel Muños, it joins in 69° 43′ west of Greenwich. The colonel formed one of the party sent in 1894 to complete the examination of the Madre de Dios begun by Colonel Pando in 1892 (*Journal*, vol. iii. p. 187). Although illness prevented his reaching the supposed confluence of the Inambari, discovered by the last-named officer, his inquiries led him to doubt the correctness of the identification of the stream seen with that river. The longitude given by Pando for the junction was 69° 43′ west (that given above for the confluence of the Tambopata), while, according to Raimondi, the Inambari bends much further to the west before taking an easterly direction. The colours of the streams from the south, noted by Señor Fiscarrald, the explorer of the Manu (*ibid.*, p. 189), and the size of the Madre de Dios above the junction, supply other arguments in the same direction. Colonel Muños also explored the Orton, which joins the Beni a little below the confluence of the Madre de Dios. Its sources do not appear to lie so far to the west as they have been placed on some maps. A land expedition was also made from Carmen, on the Madre de Dios, to the Aquiri, the result of which was to show that a narrow-gauge railway could easily be constructed between the two rivers, a work which would give a great impulse to the development of the region. Two papers, which appear in the *Boletin* of the Lima Geographical Society (vol. vi. part 3), may also be mentioned. In one of them, Dr. R. Aguilar emphasizes the importance of the discovery of the Manu, as possibly leading to the establishment of water-communication between the Department of Cuzco and the

Madre de Dios, a distance of only 3 miles separating the systems of that river and of the Ucayali, with no obstructions to the digging of a canal. The other paper describes a recent exploration by Don Pedro Portillo of the districts of Huanta and La Mar, between Ayacucho and the Apurimac. The result has been to show that a feasible route exists between that town and the head of steam-navigation on the Apurimac, the journey only occupying three days.

AUSTRALASIA.

New Exploring Expedition to German New Guinea.—An expedition has been set on foot in Germany to follow up the discoveries made in 1896 by Dr. Lauterbach and his companions. Through the courtesy of the Foreign Office, we have received the following details regarding its organization and programme, taken from the Berlin *Neueste Nachrichten*. A small stern-wheel steamer has been built, and is to be taken out at once to the mouth of the Ottilien river, the exploration of which is the main object of the proposed expedition, it being supposed that it forms the mouth of the large river (the Ramu) discovered by Dr. Lauterbach to the north of the Bismarck range. The steamer, which will be put together on arrival, will accommodate four or five Europeans and fifty natives, and carry provisions for 220 days. It is proposed also to visit and explore the Bismarck mountains, in the immediate neighbourhood of which a station will be established, and it is hoped that an easy route to the range, which probably contains gold, will be thus opened from the north. Subsequently it is intended to explore the course of the Markham river, which enters the sea at the head of Huon gulf. Should the expedition prove successful, a large area of fertile country in the interior of the Protectorate will, it is hoped, be opened up.

Funeral of the Lost Members of the Calvert Expedition.—The funeral of Mr. C. F. Wells and Mr. G. L. Jones, the lost members of the Calvert expedition, who died of thirst not far from the Joanna springs discovered by Colonel Warburton in 1873, and whose remains were discovered by Mr. L. A. Wells in June last, took place at Adelaide on July 18, amid universal manifestations of regret and sympathy. The ceremony is said to have been most impressive, and a noteworthy circumstance was the very representative gathering of members of various exploring expeditions, dating from 1844 onwards. The Start expedition of that year was represented by Dr. J. H. Browne, who was surgeon of the party, while the list of well-known expeditions, members of which were present, includes those of Stuart (1858–60), McKinlay (1865), Warburton (1873–74), Gosse (1873), Giles, and Lindsay. A full account of the ceremony appears in the Adelaide *Advertiser* for July 19. A fund is being raised in Adelaide for the benefit of the widow and children of Mr. C. F. Wells.

Examination of the Jakati River, Dutch New Guinea.—The *Tijdshrift* of the Netherlands Geographical Society (second series, vol. xiv.) contains a short account, by Dr. D. W. Horst, of an examination of the so-called Jakati river at the eastern extremity of McCluer gulf in Dutch New Guinea. According to Dr. Horst, this is not a true fresh-water river, but rather a creek widening out into an arm of the sea. The eastern extremity of McCluer gulf is strewn with islands, and between these and the mountainous north shore of the gulf a number of sandbanks, intersected by a labyrinth of channels, have been formed. Except at the foot of the mountains, the water is everywhere salt, and considerable depths were obtained by sounding. The creek was ascended as far as the town of Jakati, up to which point the ebb and flow of the tide was everywhere experienced. Dr. Horst does not, however, appear to have proved that no fresh-water river is reached by penetrating farther from the sea.

POLAR REGIONS.

Return of the Jackson-Harmsworth Expedition.—The *Windward*, with Mr. Jackson and the other members of the expedition on board, reached Gravesend on September 3, having started from Cape Flora in Franz Josef Land on August 6. Owing to the discovery that an open sea stretches to the north of the archipelago of small islands of which Franz Josef Land is found to consist, no attempt was made during the past season to reach a high northern latitude, but the time was spent in completing the survey of the islands, especially towards the west. After a comparatively mild and calm winter, during which the regular scientific observations were continued without intermission, Mr. Jackson started with Mr. Armitage, on March 16, on a sledge expedition up the British channel, the wide gulf which opens to the north of Northbrook island, on which the winter quarters were placed. In continuously bad weather the western shores of the channel were explored, and after reaching the north-east extremity of the land, the explorers turned westward and south-westward, crossing the high glaciated land behind Cape Mary Harmsworth, which proved to be the farthest land in a westerly direction. The return was made along the southern shores of the islands, a search-party consisting of Dr. Köttlitz and Messrs. Bruce and Wilson being met at Bell island on May 3. Subsequently a start was made eastward, but before Hooker island was reached the sledge broke through the thin ice off its shore, and the loss of provisions compelled a return. Before turning homewards the *Windward* steamed north-west for 50 miles through very open water, no indication of land being seen. Mr. Jackson concludes that Gillis Land does not exist in the position generally assigned to it. In addition to stores left for Andrée's possible use, a depôt had been formed on Bell island under the idea that they might be of service to the crew of the *Fram*, the news of the return of that ship not having reached Franz Josef Land until the arrival of the *Windward*. Mr. Jackson has promised to describe his experiences at an evening meeting during the coming session.

Mr. Peary and the Cape York Meteorite.—Recent telegrams announce the return of Lieut. Peary from his cruise in the Arctic. He has succeeded this time in bringing back the famous Cape York meteorite, weighing 45 tons, and supposed to be the largest in the world.

GENERAL.

The Science of Frontier Delimitation.—The report of a lecture delivered by Colonel J. K. Trotter at the Royal Artillery Institution on the above subject appears in the *Proceedings* of that Institution for May last. The class of delimitation dealt with is that relating to little-known or unexplored countries, and the lecturer's recent experience of such delimitation in West Africa enables him to speak with authority on the principal requisites for satisfactory work of the kind. At the outset, he lays stress on certain points to which regard should be paid in the preliminary stages of the work, such as the freedom from ambiguity of the international agreement fixing the boundary, and the importance of leaving as little as possible to be decided on the spot. Natural features should be followed as far as possible, it being generally found that these form fairly good dividing-lines between tribes and races. The choice of rivers greatly reduces the work of demarcation, although certain disadvantages are connected with it. Conventional lines, though often unavoidable, are very difficult to mark off. The commissioner should always be thoroughly acquainted with the whole course of negotiation which has preceded the signing of the agreement, so as to be aware of the reasons for the adoption of any particular line. A large part of the lecture naturally deals with somewhat technical details

relating to the actual work in the field. For the survey of the boundary, triangulation is recommended wherever possible, as it gives the best basis for the topographical work necessary to show the relation of the boundary to the features of the country. Special hints are given as to the demarcation of particular forms of boundary, such as a watershed, a parallel of latitude or a meridian, a straight line joining two points, or a line parallel to some given feature. The defects of such conventional lines as the latter of these are very great, and it is important that an agreement should be come to beforehand as to the manner in which the difficulties, which are sure to arise, should be met. When the work is completed, it is advisable that the frontier should be accepted by the two governments *as delimited*, even though possibly somewhat at variance with that described in the original treaty, as by this means future disputes are avoided. After the paper a discussion took place, Captain McMahon giving his experiences as delimitator of the Afghan frontier, where the work was carried out under conditions very different from those of work in West Africa; while Colonel Dalton described the work carried out in the Intelligence Department in connection with the preliminary negotiations.

The Teaching of Geography.—A leaflet has been issued by the Teachers' Guild, giving general advice with regard to the teaching of geography and the choice of books and atlases. It embodies the recommendations of a committee appointed in May last to draw up a list of important points to be considered as desiderata in the text-books and atlases employed in the teaching of geography. The course of teaching suitable for the lower, middle, and higher forms of schools respectively is traced, and a brief statement made of the particular points to which attention should be directed, both in the teachers' and pupils' books. The leaflet should be of use, not merely as a criterion of the value of existing books, but as a guide to those engaged in the preparation of geographical text-books. Copies are to be obtained at the office of the Teachers' Guild, 74, Gower Street.

OBITUARY.

Lieut.-General Sir W. Drummond Jervois, R.E., F.R.S., G.C.M.G., C.B.

Lieut.-General Sir W. Drummond Jervois, who died on August 17, in his 76th year, from the effects of a carriage accident, was an acknowledged authority on fortifications, and during a long connection with the War Office did much to improve the means of defence of the various British possessions throughout the world. Previous to his work in this direction he had seen service in South Africa, and during the Kaffir war of 1846–47 had been entrusted with the task of mapping the British section of Kaffraria. Later in life he had been Governor of the Strait Settlements and of New Zealand, retiring from the latter post in 1889. He had lived latterly at Merlwood, near Virginia Water. He joined our Society in 1878, and in 1893 was elected a Member of Council, resigning the office, however, in the following year.

Thomas Brumby Johnston.

Mr. Thomas B. Johnston, senior partner of the well-known firm of Messrs. W. & A. K. Johnston, died early in September at the advanced age of 84 years. Mr. Johnston was the youngest son of Andrew Johnston, of Penicuik, and brother

of Sir William Johnston and of the well-known geographer, Dr. Alexander Keith Johnston, gold medalist of our Society, the author of the great 'Physical Atlas' first published in 1848. On the death of the latter in 1871, Sir William Johnston having previously retired, Mr. Thomas Johnston became head of the geographical firm, a position which he retained till his death. He was a member of several learned societies, including (in addition to our own Society, which he joined in 1871) the Society of Antiquaries of Scotland, the Geological Society, and the Royal Society of Edinburgh. He was hon. treasurer of the Society of Antiquaries from 1850 to 1851, and was presented with a testimonial on his retirement from that office in the latter year. In 1877 he was appointed Geographer to the Queen for Scotland, a post previously held by his brother, Dr. A. K. Johnston. Mr. Johnston was the author of the 'Historical Geography of the Clans of Scotland,' published in 1872, and of several of the later additions to the maps in the 'Royal Atlas,' as well as of Library maps published by his firm. In 1843 he married a daughter of the late Thomas Ruddiman, and leaves five sons and three daughters.

Albert George Sidney Hawes.

The death has been announced of Mr. Albert Hawes, Her Majesty's Consul-General at Hawaii, who had been a member of our Society since 1885. Mr. Hawes entered the Royal Marines in 1859, but retired ten years later; and from 1871 to 1884 was in the Japanese service. In conjunction with Sir E. M. Satow, he published, in 1881, a 'Handbook for Travellers in Central and Northern Japan,' which since 1884 has been incorporated with Murray's series of handbooks. In 1885 he was appointed British consul in Nyasaland, taking part in the hostilities with the Arabs which broke out soon afterwards at the north end of Lake Nyasa. He was employed on special duty at Zanzibar in 1888–89, but in the latter year was transferred to the Pacific, which remained his sphere of action until his death.

CORRESPONDENCE.

"*Kech-Makurán.*"

WILL you allow me to offer a few remarks on Mr. Tate's interesting letter in the *Journal* of the Society for August?

Firstly, as to the region signified by the compound word "Kej-Makrán," or "Kech Makurán." I stated in a Report to the Bombay Government so far back as December, 1868:—

"In the chronicles of the conquest of Sind, at the early part of the eighth century, mention is made of this country as lying in the route of the invading army marching from the land of the Khalifs. In A.D. 1154, Al Edrisi calls it by its modern name without the variation of a single letter; and a century later, Marco Polo speaks of 'Res Macoran, a great kingdom of idolaters and Saracens.' That the modern word 'Mekran' is not found in the Greek or Latin writers who treat of the locality is explained by the assumption that it is a corruption of its ancient designation, or an Oriental name of doubtful origin. From the sixteenth century, and after the Portuguese established their authority in the Persian gulf, not only do we find more frequent mention of Mekran itself, but some of its towns or villages appear under their modern names. But all such information is confused. The maps, up to those of the present century, are not reliable, though several show

the particular tract required, and no satisfactory account of the country is really recorded before the publication of Sir Henry Pottinger's travels in 1816."

When writing the above, more than a quarter of a century ago, I referred to Major Leech's "Brief History of Kelat," contributed to the Asiatic Society's *Journal* in 1843; and in a paper read a few months later at Harrow, reverting to the same contribution, I said, "The maritime tracts between Karáchi and the Persian frontier include the country of the 'Ichthyophagoi,' and the modern name Makrán bears a strange similarity to the Persian 'Máhi-Khurán,' a literal translation of the Greek plural word." At the risk of placing myself in antagonism with high authority, I cannot but regard this acceptation of an undoubted Persian word (*i.e. Máhi-khorán*, or *Máicorán*, "fish-eaters") for Makrán, to be more than a mere coincidence of sound. The connection with the Greek original is almost, to my mind, convincing. *Khurán* is the present participle of the verb *khurdan*, "to eat."

Secondly, Mr. Tate thinks it probable that General Haig's "Masakand of Istakhri" is "Naskand," to the south-east of Bampur. But, in looking back to my former reports on these matters, I find that the comparatively well known "Kasarkand," south-south-east of Bampur, was subject to such perversions of spelling that it might itself be easily confused with Masakand. "Kasarkand and Rask," I wrote, "are clearly identified in the 'Kasarfund' of Ibn Haukal (A.D. 977), the 'Kesrbund' and 'Casrbund' of Istakhri and the Nubian geographer, at perhaps an equally remote period; the 'Casrebund' of Edrisi (A.D. 1154), and the Rasak of Ibn Haukal and Istakhri."

Thirdly, though not possessing data to determine any period of actual occupation by the Moghals, I venture to transcribe one or two more passages from papers which, though mainly political, contain much that is pure local history:—

"Native historians, if the term can be used for the mere tellers of tradition, make the earlier rulers of Kej to have been the Malika (or Malik) Baluchis. The town was at that remote period the capital of Mekran and the seat of government. The province extended to Mināb on the west, and Panjgúr and Kolwah on the east, all which places it comprised within its limits. Such a range explains Captain Grant's references to the eight passes into Mekran, between Mināb and Kelat. A tribe called Bulaidi dispossessed the Maliks, and were themselves reduced by the Persians, and we are then brought to the period of Nadir Shah, who made over the whole of Baluchistan, inclusive of Kelat and Mekran, to Násir Khan Brahúi." But it did not seem to me that the term "Kej Mekran" could be restricted to the province of Nasír Khan, for a century before his time we find mention by Mandelslo of "Getsche Macguerona," which must be the same compound differently spelt. If intended by Martinière (A.D. 1735) in "Kisch, petite province de Perse," it may have belonged to Persia before the days of Nádir; but the fact that many old authors and travellers would so class it does not carry much weight, for who among them has described, or attempted to describe, the actual country? The popular charts of the Indian Navy, produced during the prosperous days of that distinguished service, call the whole line of coast from Cape Jashk to Karachi "the coast of Persia," but this circumstance may not pass as historical evidence.

Of the Miri fort in Kej, alluded to by Mr. Tate, mention is made in the instructive "Notes on Mekran," submitted to the Bombay Government in 1865 by Lieut. (now Colonel Sir Charles) Ross, Assistant Political Agent; and I venture to express a hope that those notes will not be overlooked by the present generation of writers on the interesting tracts which separate Persia from British India.

F. J. GOLDSMID.

August 4, 1897.

P.S.—Since writing the above, my attention has been accidentally recalled to Sir T. Holdich's valuable contributions on 'Ancient and Mediæval Makran,' in the Society's *Journal* for April, 1896. In this it is gratifying to find that the writer admits the continuous designation of "fish-eater" for the Makráni of to-day, as in olden times. The apparent discrepancy in the orthography (*Khurán* or *Khorán*) is a matter of local pronunciation only.

It is interesting to find, from Mr. Tate's letter published in the August number of the *Journal*, that the "*Kes Macorán*" of Marco Polo is so nearly in accordance with the local pronunciation of the present day. Yakut, who followed the usage of Arab prose authors in writing *Mukrán*, says that most Arab poets preferred *Mukkarán*, and quotes examples by officials who, like Mr. Tate, had lived and held administrative charges in the province, but he evidently considered that this form of the name was only justifiable by the exigencies of metre. It should be noted that he was very careful to ascertain the correct spelling of place-names. Is Mr. Tate absolutely certain about the local pronunciation? I merely hint a doubt, because so many English officers, from Sir Frederick Goldsmid downwards, who have visited and written about the province, adhere with one accord to Makrán, or perhaps *Mekrán*, and seem to know of no variants.

Another case in which Marco Polo proves to be more correct than his commentators is that of *Camadè*, in Karmán. This name, long since vanished from the locality, has puzzled Sir Henry Yule and others. Sir Henry thought that it might have been a mistake for Hamadí or Ahmadí. General Houtum-Schindler, according to Tomaschek, "weist auf die Analogie von Kahn-i-Medí hin;" and Tomaschek himself, venturing on a still more risky piece of conjectural emendation, says we may restore Marco's place-name "to Çamadí, or, on the analogy of Serazy (Shiráz) and Soncara (Shewánkárah), to Samadí" ('Zur Hist. Topog. von Persien,' vol. i. p. 181). Yet Marco Polo was all but accurate when he wrote Camadè for *Camádín*. The latter was the name of a suburb of Jíruft, the most flourishing town in Karmán during most of the middle ages, but now represented by a heap of ruins on the upper waters of the Halir river (ancient *Divrád*.) Camádín is not mentioned by the Arab geographers, and perhaps was not in existence in their time. Later, however, its importance to traders and travellers attracted considerable attention to it, and in times of barbarous warfare its wealth proved its ruin. Muhammed Ibrahim, who wrote an account (tedious enough) of the Saljuk princes of Karmán, thus describes it as it was in the year 1171 A.D., when the troops of the Saljuk Bahram Shah plundered and desolated it: "Camádín was a place just outside of Jíruft, inhabited by foreigners from Rúm and Hind, a station for travellers by land and sea, a treasury of the opulent, a storehouse of the merchants of the East and West" (Houtsma's edition of the Persian text, p. 49). The place is mentioned several times by M. Ibrahim, who says that the battle which preceded the plundering above mentioned took place on "the plain of Camádín" (Sahra'e Camádín).

With respect to the name Kéch (or Kéj) Makrán (which is the universal pronunciation in the adjoining province of Sindh), I may mention that it was unknown to the Arab geographers of the tenth century. In their time the name of the province is found associated, not with Kíz, the capital, but with *Tíz*, the chief port of that region. El Istakhrí writes, "The port of Makrán and that part of the country is Tiz, which is known as *Tíz Makrán*." In this he is followed nearly verbatim by Ibn Haukal, and El Mukaddasí gives the port the same name. The

coupling of names in this way is due to a mere freak of vulgar fancy, and is without any real significance. The form Kéch-Makrán came into vogue at a later period, but must have been well established when Marco Polo travelled in Eastern Persia. M. R. HAIG.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Hungary. *M.K.K.G. Ges. Wien* **40** (1897): 167–186. **Vambéry.**

Ueber den Ursprung der Magyaren. Von H. v. Vambéry.

An examination of the light thrown on the question of the origin of the Magyars by linguistic, anthropological, and psychological facts.

Austria—Hungary. *M.K.K.G. Ges. Wien* **40** (1897): 212–246. ———

Ungarns Mühlenindustrie.

Baltic Glacier. *J. Geology* **5** (1897): 325–339. **Geikie.**

The Last Great Baltic Glacier. By James Geikie.

A re-statement of the author's reasons for holding, in opposition to Dr. Keilhack and other Prussian geologists, that the great terminal moraines of the Baltic ridge are the products of an independent glacial epoch.

Denmark—Pendulum Observations. **Zachariae.**
Oversigt K. Danske Vidensk. Selsk. Forhand. (1897): 139–184.

Relative Pendulmaalinger i København og paa Bornholm med Tilknytning til Wien og Potsdam. Af Generalmajor Zachariae. Avec résumé en français. *With Plate.*

Europe—Races. **Ripley.**

The Racial Geography of Europe. A Sociological Study. V. The Three European Races. By Prof. William Z. Ripley. From Appleton's *Popular Science Monthly*, June, 1897, pp. 192–209. New York: D. Appleton & Co. Size 9½ × 6½. *Illustrations. Presented by the Author.*

In this paper the author endeavours to reconstruct the main types of the population of Europe, from an investigation of the geographical distribution of particular traits, and the tendencies to combination most frequently observable in them. The three racial types thus constituted are named by him the Teutonic, the Alpine (Celtic), and the Mediterranean.

France—Botanical Map. *Ann. G.* **6** (1897): 289–312. **Flahault.**

Essai d'une carte botanique et forestière de la France. Par M. Ch. Flahault. *With Map.*

Describes the principles followed in the construction of a specimen sheet, embracing the district around Perpignan, of a proposed Botanical map of France on the scale of 1 : 200,000.

Geology. *Sitz. A. Wiss. Wien* **105** (Abth. I.) (1896): 5–40. **Mojsisovics.**

Ueber den chronologischen Umfang des Dachstein-Kalkes. Von Dr. Edmund v. Mojsisovics.

Germany—Oder. *Ann. G.* **6** (1897): 313–327. **Auerbach.**

Le régime de l'Oder. Par M. B. Auerbach.

An analysis of the most important sections, from a geographical point of view, of the voluminous work on the Oder noticed in the last volume of the *Journal* (p. 422).

Germany—Precipitation. **Bezold.**

Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. Herausgegeben durch dessen Direktor Wilhelm von Bezold. Ergebnisse der Niederschlags-Beobachtungen im Jahre 1894. Berlin: A. Asher & Co., 1897. Size 13½ × 10½, pp. xl. and 206. *Maps.*

Grecian Archipelago. *Verh. Ges. Erdk. Berlin* **24** (1897): 264–280. **Philippson.**

Herr Dr. Alfred Philippson: Die griechischen Inseln des Ägäischen Meeres. *With Map.*

A comprehensive sketch of the physical and economic geography of the Greek islands.

Greece—Geology. *Sitz. A. Wiss. Wien.* **105** (Abth. 1) (1896): 501–520. **Hilber.**

Geologische Reise in Nord-Griechenland und Türkisch-Epirus, 1895 (vorläufiger Bericht). Von Vincenz Hilber.

Italy. **Millosevich.**

Sulla opportunità che l'area delle suddivisioni del Regno venga rigorosamente evalutata per quella provinee, di cui si possiede il materiale cartografico, e per quei comuni, che non hanno contestazioni di confini. Relazione del prof. Elia Millosevich.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 159–164.

Italy—Alpine glaciers. *Mem. S.G. Italiana* **6** (1897): 171–192. **Marson.**

Sui ghiacciai del massiccio del M. Disgrazia o Pizzo Bello, nota del socio prof. Luigi Marson. *With Maps and Illustrations.*

Italy—Apennines. *Riv. G. Italiana* **4** (1897): 102–108. **Roggero.**

Ancora della linea di divisione tra l'Appennino Settentrionale e il Centrale del prof. magg. Gins. Roggero. *With Map.*

A continuation of the controversy as to the boundary between the northern and central Apennines.

Italy—Apulia. **De Giorgi.**

L'orografia delle Puglie considerata nei suoi rapporti con la Geografia, la Geologia, la Sismologia e la Climatologia. Questioni relative. Relazione del prof. Cosimo de Giorgi.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 182–192.

Italy—Benaco. *Riv. G. Italiana* **4** (1897): 23–29, 80–101. **Garbini.**

Alcune notizie fisiche sulle acque del Benaco (Colore—Trasparenza—Temperatura). Nota del Dott. Adriano Garbini.

Italy—Calabria. **Cortese.**

Sulla forma di alcune Coste della Calabria e specialmente dello Stretto di Messina. Comunicazione dell' ingegnere Emilio Cortese.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 193–199.

Italy—Cartography. **Benedictis.**

Lo stato dei lavori che si eseguono nell' Istituto Geografico Militare per la Carta d'Italia, e i metodi seguiti per formarla. Conferenza del Ten. Gen. Biagio De Benedictis.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 3–22. *Maps.*

Italy—Early Maps. **Mori.**

Di alcune Carte d'Italia del secolo XV. in rapporto con la storia della conoscenza geografica d'Italia e con quella della Cartografia. Comunicazione del dottore Assunto Mori. Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 546–558.

Italy—Earthquake. *Mem. S.G. Italiana* **6** (1897): 312–330. **Baratta.**

Sui terremoti della Romagna del 1781, studio del socio Mario Baratta. *With Map.*

Italy—Geographical Divisions. **Magistris.**

Sull' opportunità di stabilire, a vantaggio della scuola e della scienza, il limite convenzionale tra Italia Continentale e Italia Peninsulare. Relazione di Luigi Filippo de Magistris.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 500–508.

Italy—Geological Map. **Pellati.**

Sulla formazione e pubblicazione della Carta geologica del Regno. Conferenza dell' Ing. Niccolò Pellati.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 111–134. *Map.*

Italy—Glaciers. **Porro.**

Sull' opportunità che le variazioni dei ghiacciai italiani siano sistematicamente studiate, e sulle ricerche iniziate a tale scopo. Relazione del Prof. Francesco Porro. Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 176–181.

Italian Historical Gazetteer. **Vedova.**

Sui lavori per un glossario geografico dell' Italia del Medio-Evo. Relazione del Prof. Giuseppe Dalla Vedova.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 586–592.

Italy—History of Cartography. **Botto.**

Del concetto fondamentale a cui potrebbe inspirarsi la Storia della Cartografia italiana. Relazione del colonnello Antonio Botto.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 593–608.

Italy—Ischia Channel. *Ann. Hydrographie* **25** (1897): 214–215. ———

Navigirung im Kanal von Ischia. Nach dem Bericht des deutschen Konsuls in Neapel. *With Chart.*

Italy—Lake Maggiore. *Mem. S.G. Italiana* **6** (1897): 331–337. **Reale.**

Un cordone litoraneo presso Ispra sul Lago Maggiore, nota del dott. Carlo Reale. *With Maps.*

On the moraines near Ispra.

Italy—Lakes. **Vinciguerra.**

Dell' opportunità di estendere gli studi limnologici a tutti i laghi italiani e dei metodi con cui condurli. Relazione del Prof. Decio Vinciguerra. Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 205–212.

Italy—Mountains. **Porena.**

A quali distinzioni e individuazioni sistematiche debbano sottoporsi dalla Geografia le montagne della Penisola Italiana, in base delle ragioni scientifiche combinate colle opportunità didattiche, e quali siano più accettabili delle loro esteriori divisioni. Relazione del professore Filippo Porena.—Atti del II° Congresso Geografica Italiano, Roma, 1895. Roma, 1896. Pp. 464–499.

Italy—Romagna. **Gori.**

Antichi nomi dei fiumi di Romagna. Comunicazione del prof. Fabio Gori.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 538–545.

Italy—Sicily. **Marinelli.**

Distribuzione della popolazione della Sicilia rispetto alla distanza dal mare. Comunicazione del Dott. Olinto Marinelli.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 221–227.

Italy—Tuscany. *Mem. S.G. Italiana* **6** (1897): 410–435. **Stefani.**

I soffioni boraciferi della Toscana, studio del socio Carlo de Stefani. *With Map and Illustrations.*

A most interesting description of the hot springs from which boracic acid is produced on a large scale, with views of the springs and of the chemical works.

Italy—Venetia. *Mem. S.G. Italiana* **6** (1897): 338–341. **Pinton.**

Tre antiche vie romane nella Venezia, nota di Toponomastica, del socio Prof. P. Pinton. *With Map.*

On the old Roman roads in the province of Venetia.

Italy—Vesuvius. *Verh. Ges. Erdk. Berlin* **24** (1897): 295–297. **Ebeling.**

Herr Dr. Max Ebeling: Vorlage des Schichten-Reliefs des Vesuv im Massstab 1 : 10,000.

The relief-model here described was constructed by Dr. Ebeling, in conjunction with six of his pupils, as an exercise in the use of contour-maps.

Italy—Vesuvius. *Mem. S.G. Italiana* **6** (1897): 199–208. **Baratta.**

Osservazioni fatte al Vesuvio il 22 marzo 1896, nota del socio Mario Baratta. *With Map and Illustrations.*

Describes changes in the summit of Vesuvius as the result of recent eruptions.

Lapland—Eclipse Expedition. *M.K.K.G. Ges. Wien* **40** (1897): 247–253. **Kanitz.**

Die russische Muonio-Expedition zur Beobachtung der Sonnenfinsterniss im August, 1896. Von F. Kanitz. *With Plate.*

A short account of the Russian expedition up the Tornea and Muonio rivers for the observation of the solar eclipse in Lapland.

Mediterranean—Crete. *B.S.R.G. d'Anvers* **21** (1897): 158–192. **Ceuleneer.**

L'île de Crète. Par M. A. de Ceuleneer. (Also in pamphlet form.)

A sketch of the physical geography and history of the island.

Mediterranean—Crete. **Combes.**

Paul Combes. L'Île de Crète. Étude géographique, historique, politique et économique. Paris: Joseph André & Cie., 1897. Size 7½ × 5, pp. 132. *Map. Price* 1*s.* 6*d.*

A systematic description of Crete compiled from the best authorities, and containing a bibliography of the island.

Norwegian Pilot. **Hagerup.**

Den Norske Lods, udgiven af Norges Geografiske Opmaaling. 2^det^ Hefte indeholdende Ryststrækningen fra Jomfruland til Kristiansand, omarbeidet efter de Hydrografiske Undersøgelser 1887–1892, ved Edv. Hagerup. Kristiania: Grøndahl & Søn, 1896. Size 9 × 6, pp. xvi. and 312.

Russia. *Meteorolog. Z.* **14** (1897): 170–174. **Woeikof.**

Bemerkungen über die Temperatur russischer Flüsse und Seen. Von A. Woeikof.

Servia. *M.K.K. Militär-G.I.* **16**, 1896 (1897): 199–221. **Truck.**

Die erste topographische Aufnahme des Königreiches Serbien. Nach dem Werke des Kön. serb. Oberstlieutenants Joseph Simonović dargestellt, von Sigismund Truck. *With Plate.*

Description of the methods employed in the preparation of the maps of the Servian General Staff.

Switzerland. **Baedeker.**

Switzerland and the adjacent portions of Italy, Savoy, and Tyrol. Handbook for Travellers, by Karl Baedeker. With 49 Maps, 12 Plans, and 12 Panoramas. Seventeenth Edition. Leipsic: Karl Baedeker; London: Dulau & Co. 1897. Size 6½ × 4½, pp. xxx. and 484. *Price* 8 *marks. Presented by Messrs. Dulau & Co.*

Switzerland. *B.S. Neuchateloise G.* **9** (1897): 5–12. **Zobrist.**

Les Suisses en dehors de la Suisse.

On the distribution of Swiss emigrants in different parts of the world.

Switzerland. ———

Rapport du Bureau Fédéral des Assurances sur les Entreprises privées en matière d'Assurances en Suisse en 1895. Berne, 1897. Size 11 × 9½, pp. cxviii. and 128.

Turko-Grecian War. *Blackwood's Mag.* **162** (1897): 165–180. **Callwell.**

A Glimpse of the late War. By Major C. E. Callwell, R.A.

Describes the battle of Domokos, as witnessed from the Greek lines.

United Kingdom—England. **Baddeley.**

Thorough Guide Series. Yorkshire (Part II.) West and part of North Ridings and all parts of the country West of the N.E. Main Line, also Barnard Castle and

Teesdale. By M. J. B. Baddeley, B.A. Eighteen Maps and Plans by Bartholomew. Third Edition. London: Dulau & Co., 1897. Size 6½ × 4½, pp. xvi. and 150. *Price* 3*s*. *Presented by the Publishers.*

Improved and somewhat enlarged since the last edition.

United Kingdom—England. **Graves and Evans.**

The Oxford University Bicycle Club. The Roads round Oxford. An original description of the main roads and principal bye-roads within a radius of about twenty-five miles; with the mileage of longer routes. By H. Graves and A. B. Evans. With a new Map. Second Edition, enlarged. Oxford: Alden & Co. [1896]. Size 6½ × 4½, pp. viii. and 82. *Price* 1*s*. 6*d*. *Presented by the Publishers.*

A practical guide to cycling roads near Oxford. The map in this edition is by Bartholomew.

United Kingdom—England. **Gulliver.**

Dungeness Foreland. By F. P. Gulliver. From the *Geographical Journal* for May, 1897. Size 10 × 6½, pp. 12, *sections.*

United Kingdom—England, Open Lands. **Hunter.**

J.R. Statistical S. **60** (1897): 360–431.

The Movements for the Inclosure and Preservation of Open Lands. By Sir Robert Hunter.

Traces the progress of the movement for the inclosure of common lands in England down to 1869, and summarizes the results of the modern counter-movement for the preservation of open spaces.

United Kingdom—Essex, Agriculture. *J.R. Statistical S.* **60** (1897): 251–277. **Danvers.**

Agriculture in Essex during the past Fifty Years, as exemplified by the Records of one Farm, with special reference to the Prices of Corn and the Conditions of Labour. By Frederick Charles Danvers.

United Kingdom—Great Britain. **Baedeker.**

Great Britain. Handbook for Travellers by K. Baedeker. With 16 Maps, 30 Plans, and a Panorama. Fourth Edition. Leipsic: K. Baedeker; London: Dulau & Co. 1897. Size 6½ × 4½, pp. lxiv. and 556. *Price* 10 *marks*. *Presented by Messrs. Dulau & Co.*

Every effort appears to have been made, in the present edition of this well-known handbook, to maintain the standard of excellence reached by the series generally.

United Kingdom—Ireland. **Baddeley.**

Thorough Guide Series. Ireland (Part I.) Northern Counties, including Dublin and Neighbourhood. By M. J. B. Baddeley, B.A. Twenty Maps and Plans by Bartholomew. Fourth Edition—Revised. London: Dulau & Co., 1897. Size 6½ × 4½, pp. xvi. and 212. *Price* 4*s*. *Presented by the Publishers.*

This edition is revised and enlarged, the maps are clear and useful, although of different styles, and the plans of towns are particularly good.

United Kingdom—Manchester. *J.R. Agricultural S.* (3) **8** (1897): 205–228. **Bear.**

The Food Supply of Manchester.—I. Vegetable Produce. By William E. Bear. *With Illustration.*

A statement of the sources of supply of the various items of vegetable produce, and the manner of distribution to consumers.

United Kingdom—Shropshire and Cheshire. **Murray.**

A Handbook for Residents and Travellers in Shropshire and Cheshire. Third Edition, revised. With Maps and Plans. London: John Murray, 1897. Size 7 × 5, pp. 48, 156, and 6. *Price* 6*s*. *Presented by the Publisher.*

This edition has been thoroughly revised, and contains much new information respecting the parts of the country most visited by tourists and pedestrians.

ASIA.

Central Asia. **Hedin.**

Lop-nor-bäckenets vandring. Af Sven Hedin. (Aftryck ur Geol. Fören. i. Stockholm Förhandl. Bd. 18. Häft 6, 1896.) Size 8½ × 5½, pp. [16]. *Maps.*

An account of recent changes in the hydrography of the Lob Nor basin.

China, Corea, Japan—Missions. **Bishop.**
Church Miss. Intelligencer (n.s.) **22** (1897): 525–532.
Missions in China, Corea, and Japan—A Traveller's Testimony. Mrs. Bishop's Speech at St. James's Hall.

Historical—Dondin. **Gummá.**
Alfred Gummá. Le Dondiin et les Philippines. Lettres à M. le Président de la "Société Géographique de Paris." Size 6 × 3, pp. 122. *Frontispiece and Facsimile Map.*
The author of this booklet combats the theory of M. Romanet du Caillaud (*Journal*, vol. vii. p. 659) that the Dondin island of Friar Odoric represents the Philippines.

Historical. *M.K.K.G. Ges. Wien* **40** (1897): 329–419.
Die topographischen Capitel des indischen Seespiegels Mohît. *With Maps.*
This has already been referred to as a separate pamphlet (*ante*, p. 339).

India. *Imperial and Asiatic Quarterly Rev.* (3) **4** (1897): 1–10. **Lethbridge.**
India in the Sixtieth Victorian Year. By Sir Roper Lethbridge, K.C.I.E.
The writer testifies, from a close personal inspection, to the admirable working of the famine relief organization, and to the general advance made by India during the last twenty-five years.

India—Baluchistan. *Quarterly J. Geolog. S.* **53** (1897): 289–309. **McMahon.**
Notes on some Volcanic and other Rocks, which occur near the Baluchistan-Afghan Frontier, between Chaman and Persia. By Lieut.-Gen. C. A. McMahon and Captain A. H. McMahon. *With Map and Plates.*

India—Buddha's Birthplace. **Waddell.**
J. Asiatic S. Bengal **65** (Pt. I.) 1896 (1897): 275–279.
A Tibetan Guide-book to the Lost Sites of the Buddha's Birth and Death. By L. A. Waddell, M.B., etc.
This refers to the Asoka-edict pillar recently discovered in the Nepalese *tarai*, which, as the writer shows, enables us to fix the site of the birthplace of Sakya Muni.

India—Ceylon. *J. Ceylon Br. R. Asiatic S.* **14** (1897): 203–222. **Lewis.**
Place-Names in the Vanni. By J. P. Lewis, C.C.S.
The great majority of place-names in the Vanni district contain one or other of the numerous Tamil words for "tank," the specific title being taken from some natural object or occurrence connected with the place.

India—Ceylon. *J. Ceylon Br. R. Asiatic S.* **14** (1897): 118–124, 134–154. **Modder.**
Ancient Cities and Temples in the Kurunégala District: Ridí Viháré. By F. H. Modder.
Ditto: Panduwas Nuwara. By the same.

India—History. *Imperial and Asiatic Quarterly Rev.* (3) **4** (1897): 120–151. **Sewell.**
India before the English. By R. Sewell.
The writer combats the false ideas prevalent among the Hindus as to their past history.

Indo-China. *J.R. Asiatic S.* (1897): 551–577. **Gerini.**
Notes on the Early Geography of Indo-China. By G. E. Gerini. Part i. Prehistoric Period: Being Researches on Ptolemy's Geography of the India extra-Gangem. *With Map and Tables.*
A note is given on this paper (*ante*, p. 436).

Japan. *Trans. Asiatic S. Japan* **24** (1896): 12–40. **Clement.**
Chinese Refugees of the Seventeenth Century in Mito. By Ernest W. Clement.
Biographical notices of two Chinese savants, who, as refugees from China during the Tartar invasion, helped to extend a taste for learning in Japan.

Japan—Ainu Words. *Trans. Asiatic S. Japan* **24** (1896): 41–111. **Batchelor.**
Ainu Words as illustrative of Customs and Matters Pathological, Psychological, and Religious. By Rev. John Batchelor.

Japan Art. *Trans. Asiatic S. Japan* **24** (1896): 137–175. **Dooman.**
The Influence of Greco-Persian Art on Japanese Arts. By Rev. Isaac Dooman.
Under the term 'Greco-Persian' influence, the author here alludes generally to the civilization which had its origin and development in Western Asia, Egypt, and Eastern Europe.

Japan—Formosa. *Trans. Asiatic S. Japan* **24** (1896): 112–136. **Davidson.**

A Review of the History of Formosa, and a Sketch of the Life of Koxinga, the First King of Formosa. By Jas. W. Davidson.

Japan—Formosa. *J. Tōkyō G.S.* **18** (1896): 355–384. **Ishii.**

A Travel in the Northern Part of the Taiwan Island (Formosa). By Y. Ishii, Rigakushi. [In Japanese.]

Japan—Formosa. *J. Tōkyō G.S.* **19** (1896): 317–350. **Yokoyama.**

On the Island of Taiwan (Formosa). By S. Yokoyama, Nōgakushi. [In Japanese.]

Japan—Kai. *J. Tōkyō G.S.* **18** (1896): 451–488. **Jimbō.**

Some Fissures in the Mountainous Land of Minami Komagōri, Province Kai. By K. Jimbō, Rigakuhakushi. [In Japanese.]

AFRICA.

Abyssinia. **Vignéras.**

Une mission française en Abyssinie. Par S. Vignéras. Paris: A. Colin & Cie., 1897. Size 7½ × 5, pp. xiv. and 224. *Illustrations. Price* 4 *fr. Presented by the Publishers.*

M. Vignéras, who was attached to the French Mission sent to the court of King Menelik under M. Lagarde in November, 1896, gives here his general impressions of Abyssinia and its people, combined with the chronicle of the course of the expedition. The book is profusely illustrated from the author's photographs, and the information given cannot fail to be of value under existing circumstances.

Algeria. *B.S.G. et d'Archéologie d'Oran* **17** (1897): 202–242. **Doutté.**

Excursion dans la région forestière du Cap Bougarone. Par E. Doutté.

Central Africa. *B.S.R.G. d'Anvers* **21** (1897): 141–155. **Kethulle.**

Le pays des Niams-Niams. Par M. le lieutenant De la Kethulle.

Eritrea and Abyssinia. *B.S. Neuchateloise G.* **9** (1897): 32–56. **Buchs.**

Voyages en Abyssinie, 1889–1875. Par Victor Buchs. *With Illustrations.*

Massawa is described in some detail, and journeys into the neighbouring parts of Eritrea at less length.

Lagos. *J.R. Colonial I.* **28** (1897): 468–497. **Carter.**

The Colony of Lagos. By Sir Gilbert T. Carter, K.C.M.G.

NORTH AMERICA.

Discovery of America. **Dawson.**

The Discovery of America by John Cabot in 1497, being extracts from the Proceedings of the Royal Society of Canada relative to a Cabot Celebration in 1897, and The Voyages of the Cabots, a paper from the Transactions of the Society in 1896, with Appendices on Kindred Subjects. By Samuel Edward Dawson, LIT.D. (Laval). (Royal Soc. Can., vol. ii. Sec. ii.) Ottawa: J. Hope & Sons, 1896. Size 10 × 7, pp. xiv. and 30. *Facsimile Maps.*

Dr. Dawson's paper is an answer to objections made against a paper published by him in 1894, in which he advocated Cape Breton as the landfall of John Cabot.

Mexico—Geology. *J. Geology* **5** (1897): 384–390. **Bain.**

A Sketch of the Geology of Mexico. By H. Foster Bain.

A *résumé* of a report recently published by the Geographical Institute of Mexico.

Mexico—Lower California. *Ymer* **17** (1897): 91–151. **Eisen.**

En färd till Baja California och Sonora. Af G. Eisen.

United States—California. *J. Geology* **5** (1897): 340–348. **Walcott.**

The Post-Pleistocene Elevation of the Inyo Range, and the Lake Beds of Waucobi Embayment, Inyo County, California. By Charles D. Walcott. *With Map and Illustrations.*

United States—California—Submerged Valleys. **Davidson.**

The Submerged Valleys of the Coast of California, U.S.A., and of Lower California, Mexico. By George Davidson, A.M., PH.D., etc. With Nine Plates. *Proceedings*

of the California Academy of Sciences. Third Series. Geology. Vol. i. No. 2. San Francisco, 1897. Size 10 × 7½, pp. 71–103. *Presented by the Author.*

Nearly thirty submerged valleys are described as occurring off the coasts of Upper and Lower California. The importance of their thorough investigation is shown by the fact that vessels have been led into danger by the deep soundings obtained when running up their axes.

United States—Eleventh Census.

[Eleventh Census of the United States. 1890.] Report on the Insane, Feeble-Minded, Deaf and Dumb, and Blind, by John S. Billings, M.D. (1895, pp. x. and 756, *Diagrams*); Insurance Business, Part ii.—Life Insurance, by Charles A. Jenney (1895, pp. xii. and 478); Vital and Social Statistics, Part ii.—Vital Statistics: Cities of 100,000 population and upward, by John S. Billings, M.D. (1896, pp. viii. and 1182, *Maps and Diagrams*); Ditto. Part iv.—Statistics of Deaths, by the same (1895, pp. iv. and 1034); Crime, Pauperism, and Benevolence, Part i.—Analysis [of Statistics], by Frederick H. Wines (1896, pp. vi. and 412); Farms and Homes: Proprietorship and Indebtedness, by George K. Holmes and John S. Lord (1896, pp. x. and 646, *Maps and Diagrams*). Washington. Size 12 × 9½.

United States—Missouri. *J. School G.* **1** (1897): 110–117, 144–150. **Marbut.**

Missouri. By C. F. Marbut.

A sketch of the State of Missouri, showing the influence which its physical geography has had on the life of its inhabitants.

United States—South Carolina. *National G. Mag.* **8** (1897): 152–154. **Glenn.**

Applied Physiography in South Carolina. By L. C. Glenn.

Describes the physiographical changes resulting from the present system of farming, and their ruinous results.

United States—Virginia. **Phillips.**

Smithsonian Miscellaneous Collections. 1039. Virginia Cartography: a Bibliographical Description. By P. Lee Phillips. Washington: The Smithsonian Institution, 1896. Size 10 × 6½, pp. 86.

An extremely interesting piece of work, giving an account not only of the early maps of Virginia but also of those who produced them. The series begins with With's map of 1585 and comes down to 1893. The main object of the monograph is to trace the history of maps which have been torn from the volumes containing them and are in danger of being lost sight of.

CENTRAL AND SOUTH AMERICA.

Central America—Costa Rica. *National G. Mag.* **8** (1897): 143–151. **Villafranca.**

Costa Rica. By Señor Ricardo Villafranca. *With Illustrations.*

Central America—Rainfall. *Petermanns M.* **43** (1897): 117–119 **Sapper.**

Regenfall im nördlichen Mittelamerika. Von Dr. Karl Sapper. *With Maps.*

Colombia. *Mem. S.G. Italiana* **6** (1897): 436–460. **Dorfo.**

La repubblica di Colombia e la sua situazione economica, studio di Raniero de Dorfo.

Colombia. *Naturwiss. Wochenschrift* **12** (1897): 231–234. **Regel.**

Reisebriefe aus Colombia. Von Prof. Dr. Fritz Regel.

Cuba. *B.S.R. Belge G.* **21** (1897): 93–112. **Du Fief.**

Île de Cuba. Par J. Du Fief. *With Map.*

A systematic compilation, with references to original sources.

Interoceanic Canal. *Petermanns M.* **43** (1897): 134–137. **Polakowsky.**

Der Interozeanische Kanal. Von Dr. H. Polakowsky.

On the Panama and Nicaragua Canal schemes.

Jamaica. **Musson and Roxburgh.**

The Handbook of Jamaica for 1897. Comprising Historical, Statistical, and General Information concerning the Island. Compiled . . . by S. P. Musson and T. L. Roxburgh. London: E. Stanford, 1897. Size 9 × 6, pp. viii. and 586. *Map. Price 7s. 6d. Presented by the Publisher.*

Straits of Magellan. *National G. Mag.* **8** (1897): 129–141. **Meade.**

A Winter Voyage through the Straits of Magellan. By the late Admiral R. W. Meade. *With Map.*

The voyage here described appears to have been made in the middle of 1871.

Tierra del Fuego. *Ann. G.* **6** (1897): 347–356. **Nordenskjöld.**

L'expédition suédoise à la Terre de Feu (1895–1897). Par M. Otto Nordenskjöld. *With Plates.*

This article gives the general impressions of nature and man in South Patagonia, gained by the writer during the course of the recent Swedish expedition to that region.

Venezuela and British Guiana. *Ann. G.* **6** (1897): 369–372. **Gallois.**

La territoire contesté entre le Venezuela et la Guyane Anglaise. Par M. L. Gallois.

A brief statement of the most salient points in the British Guiana boundary question.

AUSTRALASIA AND PACIFIC ISLANDS.

German New Guinea. **Tappenbeck.**

Deutsche Kolonialzeitung (Beilage) (*N.F.*) **10** (1897): 4, 21–24.

Kurze Uebersicht über den Verlauf der Kaiser-Wilhelmsland-Expedition. Von E. Tappenbeck. *With Illustrations.*

German New Guinea—Huon Gulf. **Rüdiger.**

Verh. Ges. Erdk. Berlin **24** (1897): 280–295.

Herr Korvetten-Kapitän H. Rüdiger: Der Huon-Golf im Südosten von Kaiser Wilhelms-Land. *With Map.*

A description of the coast-features of Huon gulf, from personal knowledge acquired in the service of the German New Guinea Company.

New Caledonia. *J. Tōkyō G.S.* **19** (1896): 125–168. **Tajima.**

Notes on New Caledonia and Some Islands lying close to it. By Colonel N. Tajima. [In Japanese.]

New South Wales—Meteorology. **Russell.**

Department of Public Instruction. Meteorology of New South Wales. Results of Rain, River, and Evaporation Observations made in New South Wales, during 1895, with Maps and Diagrams. By H. C. Russell, B.A., etc. Sydney, 1896. Size 10 × 6½, pp. lxxxiv. and 200. *Price* 3*s.* 6*d.*

Queensland—Almanac and Directory. **Pugh.**

Pugh's Almanac and Queensland Directory for 1897. Brisbane: Gordon & Gotch, 1897. Size 7½ × 5, pp. 640 and 356. *Map, Plan, and Illustrations.*

A compendium of information upon Queensland, with numerous illustrations and large-scale maps.

Queensland—Mt. Peter Botte. **Le Souef.**

Ascent of Mt. Peter Botte, North Queensland. By D. Le Souef. [Read before the Field Naturalists' Club of Victoria, February 8, 1897.] [Reprinted from the *Victorian Naturalist*, March—April, 1897.] Size 9 × 5½, pp. 16. *Plate.*

POLAR REGIONS.

Arctic—Voyage of Fram. *Verh. Ges. Erdk. Berlin* **24** (1897): 249–264. **Nansen.**

Herr Dr. Fridtjof Nansen: Durch das Polargebiet. *With Map.*

Nansen Reception. *C. Rd., S.G. Paris* (1897): 121–148. ——

Réception du Dr. Fridtjof Nansen, 25 mars—1er avril 1897. *With Portrait and Map.*

Polar Regions. **Prentiss.**

The Great Polar Current. Polar Papers, Old and New. By Henry Mellen Prentiss. Cambridge: Printed at the Riverside Press, 1897. Size 7½ × 5, pp. 154. *Presented by the Author.*

This will be separately noticed.

Spitsbergen. *Alpine J.* **18** (1797): 363–384. **Garwood.**

Across Spitsbergen with Sir Martin Conway, with an Account of the Ascent of Hornsund Tind. By Edmund J. Garwood. *With Illustrations.*

Spitsbergen. *B.S.G. Commerc. Bordeaux* **20** (1897): 250–264. **Voll.**

Voyage au Spitzberg. Par Nils Voll. *With Map and Illustrations.*

Account of a tourist trip.

Spitsbergen and Norway. **Wegener.**

Zum ewigen Eise. Eine Sommerfahrt ins nördliche Polarmeer und Begegnung mit Andrée und Nansen. Von Georg Wegener. Zweite Auflage. Berlin: Allgemeiner Verein für Deutsche Litteratur, 1897. Size 9 × 6¼, pp. xii. and 360. *Maps and Illustrations. Price* 6*s. Presented by the Author.*

An entertaining account of the trip of the *Erling Jarl* to Spitsbergen and Vadsö (for the solar eclipse) in August, 1896, together with a sketch of the plans for polar exploration associated with the names of Nansen and Andrée.

Swedish Polar Researches. *Ymer* **17** (1897): 153–157. **Nathorst.**

Ett önskningsmål för den svenska polar-forskningen. Af A. G. Nathorst.

The writer urges the construction of a Swedish arctic exploring vessel on somewhat similar lines to the *Fram*, and points out several pieces of exploration which might be done by such a ship.

MATHEMATICAL GEOGRAPHY.

Barometric Altitudes. **Benedictis.**

I progressi della livellazione barometrica. Comunicazione del Ten. Generale Biagio De Benedictis.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 149–152.

Cartography. *M.K.K. Militär-G.I.* **16**, 1896 (1897): 131–142. **Hübl.**

Beiträge zur Technik der Kartenerzeugung. Von Arthur Freiherrn von Hübl. *With Maps.*

Shows how some of the disadvantages of photographic methods of cartography can be overcome.

Cartography. *Rev. Maritime* **133** (1897): 193–201, 417–434. **Lavieuville.**

Notice sur les cartes marines. Par M. G. Lavieuville.

Contains hints on the manner of using marine charts.

Cartography. *M.K.K. Militär-G.I.* **16**, 1896 (1897): 67–98. **Rummer.**

Die Photogrammetrie im Dienste der Militär-Mappierung. Von Adolf Rummer von Rummershof. *With Illustrations.*

Cartography. *M.K.K. Militär-G. I.* **16**, 1896 (1897): 51–66. **Steeb.**

Terraindarstellung mit Schiefer Beleuchtung. Von Christian Ritter von Steeb. *With Maps.*

Sets forth the disadvantages of "side-lighting" in the delineation of mountainous countries.

Cartography. *B.S. Neuchateloise G.* **9** (1897): 159–164. **Guyou and Reclus.**

D'un Atlas à échelle uniforme proposé. Par Georges Guyou et Élisée Reclus.

Proposal for an atlas of the world on a uniform scale of 1: 10,000,000. The size of each sheet is proposed to be 20 inches by 28, 38 being required to include the whole surface of the Earth. From the large atlas a pocket edition on the scale of 1: 50,000,000 might be made.

Decimal Division of Time. *B.S.G. et d'Archéologie d'Oran* **17** (1897): 176–201. **Sarrauton.**

Conférence sur l'Heure décimale. Par H. de Sarrauton. *With Plates.* L'Heure décimale au Bureau des Longitudes. By the same.

Geodesy. **Zanotti-Bianco.**

Sulle misure di arco di meridiano compiute da Italiani e loro contributo all'esatta notizia della figura della Terra. Relazione dell' Ing. Ottavio Zanotti-Bianco.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 137–139.

Geodetic datum line. **Guarducci.**

Sulla opportunità di stabilire in Roma un caposaldo per le quote italiane. Relazione del Dottor Ing. Federico Guarducci.—Atti del II° Congresso Geografico Italiano, Roma, 1895. Roma, 1896. Pp. 140–148.

Nautical Astronomy.

Aufruf zur Umgestaltung der Nautischen Astronomie, nebst Anhang, 1896. Dorpat, 1893. Size 13½ × 10½, pp. 30 and 10.

Tides and Wind. *Ann. Hydrographie* **25** (1897): 200–207.

Der Einfluss des Windes und des Luftdruckes auf die Gezeiten.

Trigonometric Survey. *M.K.K. Militär-G.I.* **16**, 1896 (1897): 143–198.. **Weixler.**

Ausgleichung trigonometrischer Messungen nach der Methode der geometrischen Orter. Von Adolf Weixler. *With Plates.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Meteorological Conference.

Official, No. 127. Report of the International Meteorological Conference. Paris, 1896. Published by authority of the Meteorological Council. London: Eyre and Spottiswoode, 1897. Size 10 × 6½, pp. 90. *Illustrations. Price* 1*s. Presented by the Meteorological Office.*

Meteorological Hints. **Marriott.**

Hints to Meteorological Observers, with Instructions for taking Observations, and Tables for their Reduction. Prepared under the direction of the Council of the Royal Meteorological Society. By William Marriott. Fourth Edition. London: E. Stanford, 1897. Size 10 × 6½, pp. 48. *Illustrations. Price* 1*s.*

Oceanography—Red Sea. *Ann. Hydrographie* **25** (1897): 165–169.

Hydrographische Forschungen im Rothen Meere (Mit einer Tiefenkarte des Golfes von Akabah).

A summary of the soundings of the *Pola.*

Oceanography—Speculation. *P.A. Nat. Sci. Philadelphia* (1897): 12–17. **Morris.**

The Primeval Ocean. By Charles Morris.

Speculations on the composition, thermal and vital conditions, of the primitive ocean.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *G.Z.* **3** (1897): 256–267, 315–326. **Vierkandt.**

Die Kulturformen und ihre geographische Verbreitung. Von Privatdozent Dr. A. Vierkandt. *With Maps.*

Environment. *Blackwood's Mag.* **162** (1897): 227–235. **Robinson.**

Faces and Places. By Dr. Louis Robinson.

A study of the influence of locality upon the human face.

Historical. **Columba.**

La tradizione geografica dell' età romana, Relazione del Prof. Gaetano Mario Columba.—Atti del II° Congresso Italiano, Roma, 1895. Roma, 1896. Pp. 511–537.

Historical—Cabot. *Nautical Mag.* **66** (1897): 534–543. **Baker.**

John Cabot and the Discovery of Newfoundland. By Sir Sherston Baker, Bart.

Historical Maps. **Winsor.**

Baptista Agnese and American Cartography in the Sixteenth Century. By Justin Winsor. [Reprinted from the 'Proceedings of the Massachusetts Historical Society,' May, 1897.] Cambridge: John Wilson & Son, 1897. Size 10 × 6½, pp. 16.

Historical Maps. **Ruge**

The Development of the Cartography of America up to the year 1570. By Dr. Sophus Ruge.—Annual Report . . . of the Smithsonian Institution . . . to July, 1894. Washington: 1896. Size 9½ × 6, pp. 281–296. *Plates.*

Translated from *Ergänzungsheft* 106 to *Petermanns Mitteilungen* for 1892.

BIOGRAPHY.

Dickson. *Ymer* **17** (1897): 159–165. **Nathorst.**

Oscar Dickson. Af A. G. Nathorst. *With Portrait.*

Elias. **Wheeler.**

Obituary. Ney Elias, C.I.E. By Stephen Wheeler. From the *Geographical Journal* for July, 1897. Size 10 × 6½, pp. 6. *Portrait.*

Meade. *National G. Mag.* **8** (1897): 142. ——

Admiral R. W. Meade, U.S.N. *With Portrait.*

Mouat. *J. R. Statistical S.* **60** (1897): 434–437. ——

Dr. Frederic John Mouat, M.D., LL.D.

GENERAL.

Colonies—Java and the Congo. *B.S.R.G. d'Anvers* **21** (1897): 197–214. **Leclercq.**

Le Java et le Congo au point de vue colonial. Par M. Jules Leclercq.

The writer draws a parallel between Java and the Congo, and thence deduces the value of the latter to Belgium.

Geography. **Gebelin.**

Essai de Géographie Appliquée. Par Jacques Gebelin. Première partie: Synthèse; Premier Fascicule: Applications de la Géographie générale. (Extrait du *Bulletin* de la Société de géographie commerciale de Bordeaux, année 1896.) Bordeaux: Feret et Fils, 1896. Size 9½ × 6½, pp. 88. *Presented by the Author.*

The commencement of a treatise on applied geography, *i.e.* geography in relation to the immediate wants of men.

Geological Model. *Naturwissens. Wochenschrift* **12** (1897): 241–246. **Zache.**

Die Grundzüge einer Bildungsgeschichte der Erdrinde innerhalb der deutschen Grenze erläutert an der Geologischen Wand im Humboldthain zu Berlin. Von Dr. Eduard Zache. *With Illustrations.*

The article describes a geological model at Humboldthain in Berlin, which is constructed of the actual rocks the forms and relative positions of which it illustrates.

German Colonies. ——

Jahresbericht der Deutschen Kolonialgesellschaft, 1896. Berlin, 1897. Size 9½ × 6½, pp. 80.

Kew Observatory. ——

Description of the Kew Observatory. [From the "Record" of the Royal Society.] Size 8½ × 5½, pp. 18. *Plans.*

Kew Observatory. ——

The Kew Observatory, Old Deer Park, Richmond, Surrey. 1896. Report of the Kew Observatory Committee of the Royal Society for the Year ending December 31, 1896. [From the *Proceedings of the Royal Society*, 1897.] London: Harrison & Sons, 1897. Size 8½ × 5½, pp. 34. *Presented by the Royal Society.*

Lighthouses. ——

No. 30 [U.S.] Hydrographic Office. List of Lights of the World. Vol i. East and West Coasts of North and South America (excepting the United States), including the West India and Pacific Islands. Corrected to October 24, 1896. Washington, 1896. Size 11½ × 9, pp. 56 and xiv. *Presented by the U.S. Hydrographic Office.*

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

ASIA.

Central Asia. ——

Sketch-map of routes traversed by European and Asiatic Explorers beyond the British Frontier from 1865 to 1897. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. London: Stanford's Geographical Establishment. 1897. *Presented by the India Office.*

This is a new edition of a map to accompany 'A Memoir on the Indian Surveys, 1875–1890,' by E. D. Black. In the present instance hill-shading has been added, and, as will be seen by the title, it purports to show all the routes followed by European and Asiatic travellers beyond the British frontier from 1865 to 1897. The map can

however, hardly be considered to have been brought up to the date mentioned, 1897, as the very important route followed by Mr. St. George R. Littledale in 1895 does not appear, neither is the route traversed by Prince Henry of Orleans, from Tali-fu to Sadiya, shown.

AFRICA.

Western Sudan. **Meyer.**

I. Die Völker des West Sudan. II. Handel und Verkehr im West-Sudan. III. Die Staatenbildungen des West-Sudan. Scale 1 : 10,000,000 or 157·8 stat. miles to an inch. 4 maps on 1 sheet. *Petermanns Geographische Mitteilungen*, Ergänzungsheft No. 121, "Erforschungsgeschichte und Staatenbildungen des Westsudan," von Dr. Paul Constantin Meyer. Gotha: Justus Perthes, 1897. *Presented by the Publisher.*

AMERICA.

Canada. **Department of Railways and Canals, Canada.**

Map showing the Railways of Canada to accompany the annual report on Railway Statistics, 1896. Scale 1 : 2,750,000 or 43·4 stat. miles to an inch. Compiled by E. V. Johnson. 3 sheets. Montreal: Department of Railways and Canals, 1896. *Canadian Government Office, London.*

On this map the railways are all shown in red, each line having a number by which its name can be found in a table which is furnished. The progress made with the construction of the railways six months later than described in the annual report of railway statistics, which it accompanies, is shown on this map. In addition to Canadian railways, the lines with which they connect in the United States are given, and, for general purposes of reference, this will be found a useful map.

AUSTRALIA.

Brisbane. **Pugh.**

Map of Brisbane and Suburbs, issued with 'Pugh's Almanac.' Brisbane: Gordon & Gotch, 1897. *Presented by the Publishers.*

Queensland. **Pugh.**

Map of Queensland, compiled and lithographed from Official maps for 'Pugh's Almanac.' Scale 1 : 3,000,000 or 47·6 stat. miles to an inch. Brisbane: Gordon & Gotch, 1897. *Presented by the Publishers.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published at the Hydrographic Department, Admiralty, during May and June, 1897.

No.	Inches.	
2585		England :—Coastguard stations. 2*s.*
2586		Scotland :—Coastguard stations. 2*s.*
2587		Ireland :—Coastguard stations. 2*s.*
2886	m = 6·85	Ireland, west coast :—Killary bay. 2*s.* 6*d.*
1210	m = 6·8	Ireland, south coast :—Berehaven. 3*s.* 6*d.*
326	m = 0·54	Denmark :—Great belt. 3*s.*
1317	m = 0·37	Balearic islands :—Majorca and Minorca. 2*s.* 6*d.*
1710	m = 4·65	Algeria :—Bougie. 1*s.* 6*d.*
2896	m = 5·9	Newfoundland, east coast :—White and River Head bays. 1*s.* 6*d.*
2789H	m = 2·37	North America :—River St. Lawrence above Quebec. Sheet xxi. Cole shoal light to Rockport. 2*s.*
2789I	m = 2·37	North America :—River St. Lawrence above Quebec. Sheet xxii. Rockport to Burnt island light. 2*s.*
464	m = 1·77	North America, east coast :—Passamaquoddy bay and St. Croix river. 2*s.* 6*d.*
405	m = var.	Harbours and anchorages in the Bahama islands :—Highborne cut, Ship channel, Fleeming or Six Shilling channel (reproduction). 1*s.* 6*d.*
398	m = 2·0 m = 4·7	Harbours and anchorages in the Bahama islands :—Whale cay channel and Green Turtle cay anchorage, Great Stirrup cay (reproduction). 1*s.* 6*d.*
41	m = 0·5	India, west coast :—Delta of the Indus, Cape Monze to Kediwari mouth. 2*s.* 6*d.*

No.	Inches.	
1416 m =	var.	Anchorages on the north-west coast of New Guinea :—Boni harbour, Patippi bay, Selé or Kabobolol strait, Karas island anchorage, Kaimana bay, Wardenburg group, Dubus haven, Segaar bay, Lakahia bay, Ekka island anchorage. 2*s.*
2874 m =	2·4	Japan :—Setozaki harbour. 1*s.* 6*d.*
2883 m =	2·8	Japan, Nipon, south coast :—Yeno Ura. 1*s.* 6*d.*
1786		Anchorages on coast of Honduras :—New plan, Hospital bight.
2110		Anchorages in south-east Alaska :—Plans added, Port Chester, Chasina anchorage.
2376		Harbours in Formosa :—New plan, Tamsui harbour.
134		Harbours and anchorages in New Hebrides :—Plans added, Picot bay, Ringdove anchorage, Vi Paka anchorage, Torres or Vava islands.

(*J. D. Potter, Agent*).

Charts Cancelled.

No.	Cancelled by	No.
2585 England: — Coastguard stations.	New Chart. England :—Coastguard stations . . .	2585
2586 Scotland :—Coastguard stations.	New Chart. Scotland :—Coastguard stations . . .	2586
2587 Ireland :—Coastguard stations.	New Chart. Ireland :—Coastguard stations	2587
326 Great Belt.	New Chart. Great Belt	326
1766 Plan of Bougie on this sheet.	New Chart. Bougie	1710
1717 Highborne cut. 1509 Ship channel. 405 Fleeming or Six Shilling channel.	New Chart. Harbours and anchorages in the Bahama islands	405
398 Whale cay channel and Green Turtle cay anchorage. 1432 Great Stirrup cay.	New Chart. Harbours and anchorages in the Bahama islands	398
41 Indus Tidal channels from Manora point to Kalia river.	New Chart. Cape Monze to Kediwari mouth . . .	41
1416 Anchorages on north-west coast of New Guinea.	New Chart. Anchorages on the north-west coast of New Guinea	1416
996 Plan of Yeno Ura on this sheet. 2293 Plan of Altata harbour on this sheet. 134 Plan of Segoud channel on this sheet.	New Chart. Yeno Ura	2883

Charts that have received Important Corrections.

No. 1165, Wales :—Tenby and Caldy roads. 2006, Scotland, west coast :—River Clyde from Greenock to Dumbarton. 2706, Ireland, west coast :—Ballynakill and Killary bays. 1840, Ireland, south coast :—Bantry bay, Sheet i. 2339, North Sea, general. 2182B, North sea, north part. 417, Germany :—Graa Deep. 1887, Germany :—Eider river to Blaavand point. 2842B, Baltic sea, eastern sheet. 2360, Sweden :—Falsterbö point to Kalmar sound. 2114, Baltic entrance :—The Kattegat. 2302, Gulf of Bothnia :—Tome point to Tauvö. 2365, Germany :—Rostock to Arkona light. 2364, Germany :—Lubeck bay and Femern belt. 2150, Germany :—Femern to Bornholm. 2325, Denmark :—Lüm Fiord. 2115, Denmark :—The Sound. 2229, Denmark :—Entrance to Great and Little belts. 2138, Denmark :—Approaches to the Grön sound and the Stor Strom. 213, Denmark :—Entrance to Grön sound. 790, Denmark :—Approaches to Copenhagen, etc. 2117, Germany :—Keil bay. 155, Italy, west coast :—Gulf of Spezia. 2608, France, south coast :—Approaches to Toulon. 2607, France, south coast :—Marseille to Agay road. 289, Newfoundland :—Bay of Islands, etc. 283, Newfoundland :—Codroy road to Cowhead harbour. 284, Newfoundland :—Cowhead harbour to Ste Geneviève bay, etc. 2027, Prince Edward island :—Cascumpeque harbour. 678, North America :—Lakes Erie and Huron. 2895, North America, east coast :—Rockport harbour. 853, North America, east coast :—St. Andrew sound to St. John river. 2384,

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(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for August, 1897, and North Pacific Ocean for July and August, 1897. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

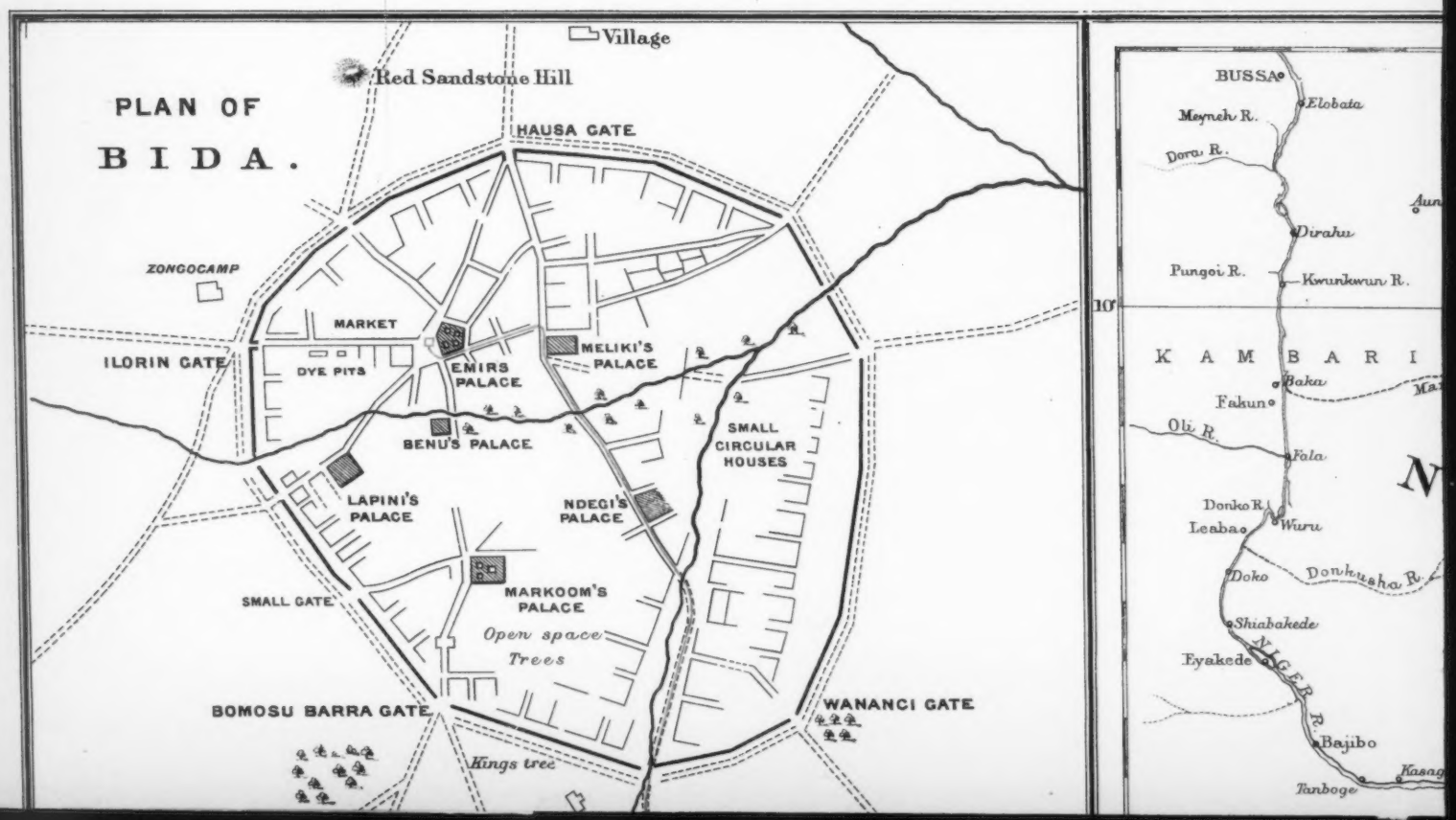
Chin Hills. **Rigby.**

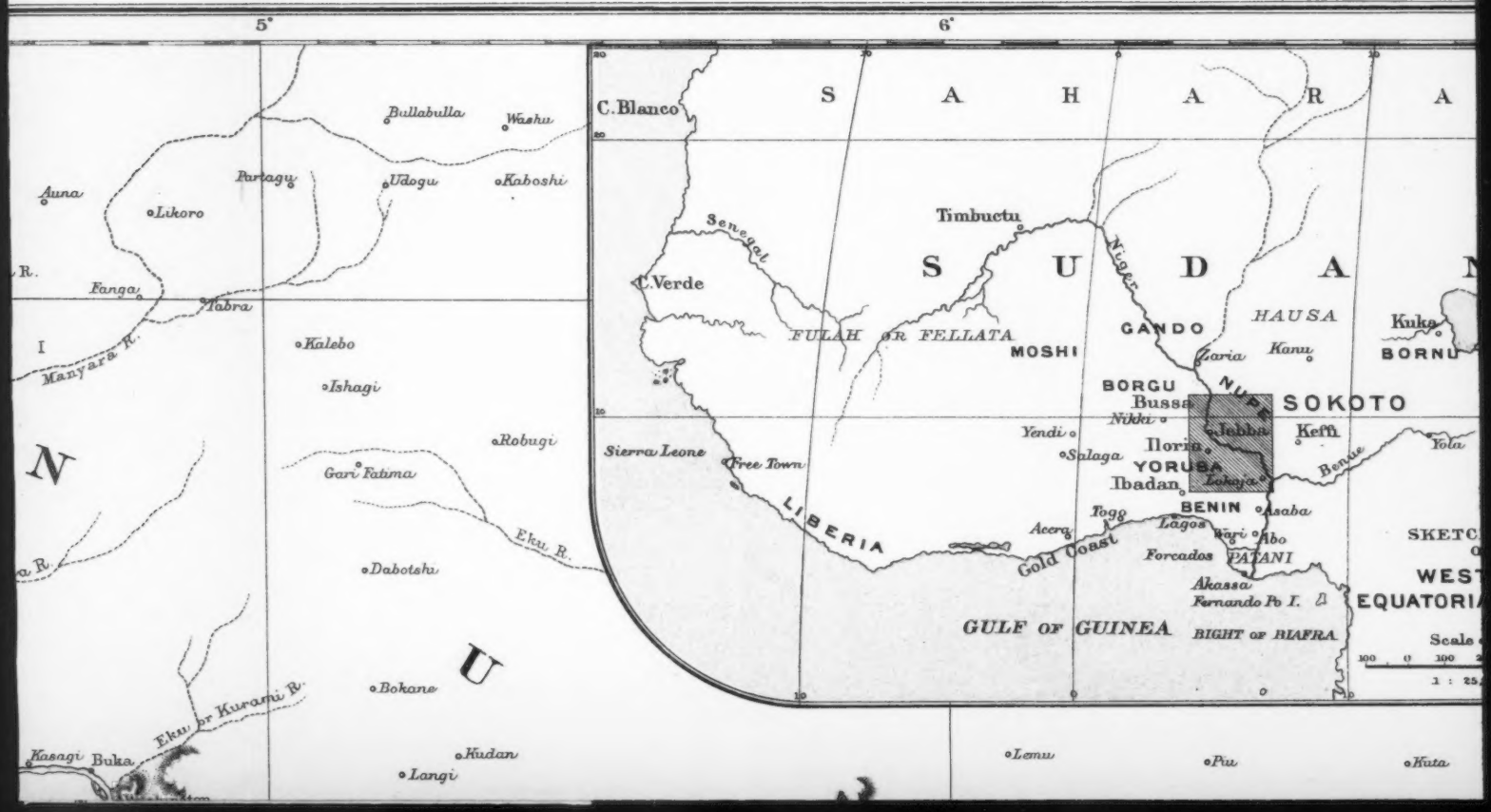
Thirty-nine Photographs of the Natives and Scenery of the Chin Hills, taken by Captain G. C. Rigby. 1896–97. *Presented by Captain G. C. Rigby.*

This series is interesting as showing the types of natives and scenery in the Chin hill country, and constitutes a valuable addition to the collection of the Society.

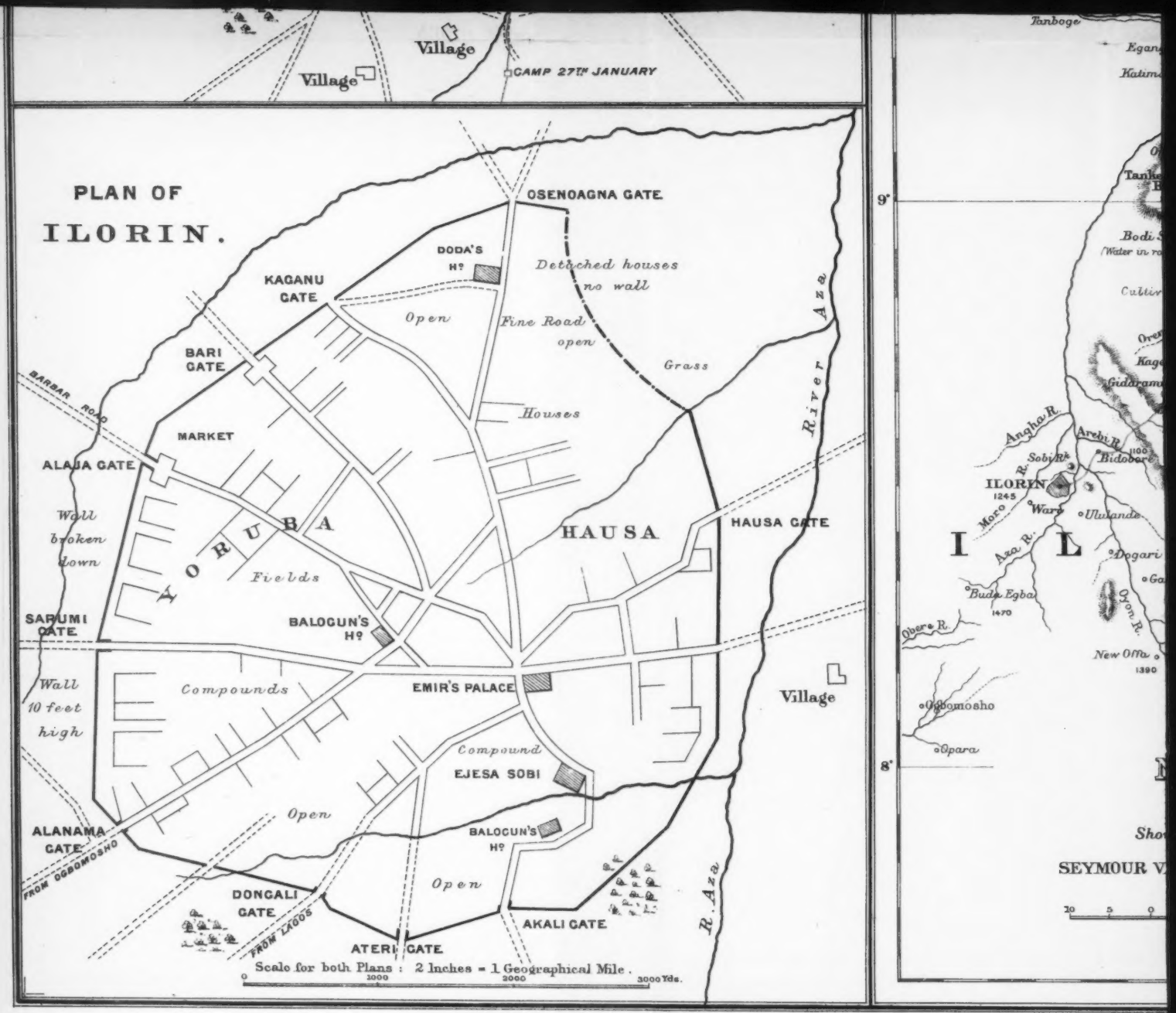
(1) The two last captive slaves in the Kok Dok; (2) A Mro man, Semi, North Arakan hill tracts; (3) Yindu Chin woman; (4) Chief of Dok, cane-belly Chins, Arakan Yomas; (5) Ditto; (6) Frontier stockade, Pengwah, Lemru river; (7) Yindu Chins, Myaing Mon valley; (8) Ditto; (9) A bamboo bridge built by Chins across the Lemru river; (10) Chin-paid chief "Natan;" baskets used for packing stores; (11) Interior of Mindat fort (attacked by Chins in 1895), Yawdwin Chin hills; (12) A corner of camp; (13) Humon, leader of the raid on Myaing in guard; Kok Dok Arakan Yomas; (14) A glimpse of the Arakan Yomas from the Mount Victoria range; (15) Chinbok girls; (16) Ditto; (17) Ditto; (18) Chinbok Chins, Chey valley; (19) A Chinbok valley; (20) Chinbok woman weaving; (21) A cane-belly Chin village, Mon valley; (22) On the Mon river; (23) Chinbok Chins, M'Chum village, Mon valley; (24) Gateway of a Chinbok village, Mon valley, decorated with bison skulls; (25) Chutim village (Chinbok), Chey valley; (26) Chinbok Chins, Chey valley, Yawdwin Chin hills; (27) Cane-belly Chins, Arakan Yomas; (28) Pengwah, frontier outpost on Lemru river, North Arakan hill tracts; (29) Chinbok Chins, Yawdwin Chin hills, trophy posts in background; (30) Chinbok girls, Chey valley, Yawdwin Chin hills; (31) Chutim village (Chinbok), Chey valley, Yawdwin Chin hills; (32) Chinbok police, Mindat fort, Yawdwin Chin hills; (33) Yindu Chins, Yawdwin Chin hills; (34) Officer's camp, Atet Myaing Yindu column; (35) Cane-belly Chins, Mon valley, Yawdwin Chin hills, a previously unknown tribe of Chins; (36) A cane-belly Chin woman, Chey valley, the earrings are made out of the top part of a gourd, filled with beadwork; (37) Cane-belly Chins, Mon valley; (38) Ditto; (39) No title.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


PLAN OF
BIDA.
Village
Red Sandstone Hill
HAUSA GATE
ZONGOCAMP
MARKET
ILORIN GATE
DYE PITS
EMIRS PALACE
MELIKI'S PALACE
BENU'S PALACE
SMALL CIRCULAR HOUSES
LAPINI'S PALACE
NDEGI'S PALACE
MARKOOM'S PALACE
SMALL GATE
Open space
Trees
BOMOSU BARRA GATE
WANANCI GATE
Kings tree
BUSSA
Elobata
Meyneh R.
Dora R.
Dirahu
Pungoi R.
Kwurkwun R.
10°
K A M B A R I
Baka
Fakun
Oli R.
Fola
Donko R.
Leaba
Wuru
Doko
Donkusha R.
Shiabakede
Eyakede
N I G E R R.
Bajibo
Tanboge


5°
6°
C.Blanco
S A H A R A
Timbuctu
Senegal
Niger
C.Verde
S U D A N
FULAH OR FELLIATA
MOSHI
GANDO
HAUSA
Kuka
BORNU
Zaria
Kano
BORGU
Bussa
NUPE
SOKOTO
Nikka
Jebba
Kefn
Yola
Yendi
Salaga
Ilorin
Sierra Leone
Free Town
YORUBA
Ibadan
Benue
LIBERIA
Togg
BENIN
Asaba
Lagos
Acera
Gold Coast
Forcados
PATANI
Akassa
Fernando Po I.
GULF OF GUINEA
BIGHT OF BIAFRA
Auna
Likoro
Partagu
Udogu
Kaboshi
Bullabulla
Washu
Fanga
Yabra
Manyara R.
Kalebo
Ishagi
Robugi
Gari Fatima
Eku R.
Dabotshi
Bokane
Eku or Kurani R.
Kasagi
Buka
Kudan
Langi
Lemu
Piu
Kuta
Scale
1 : 25

7°
A
N
L. Chad
RNU
Shari
Yola
10°
SKETCH MAP
OF
WESTERN
ATORIAL AFRICA
Scale of Miles.
100 200 300 400 500
1 : 25,000,000



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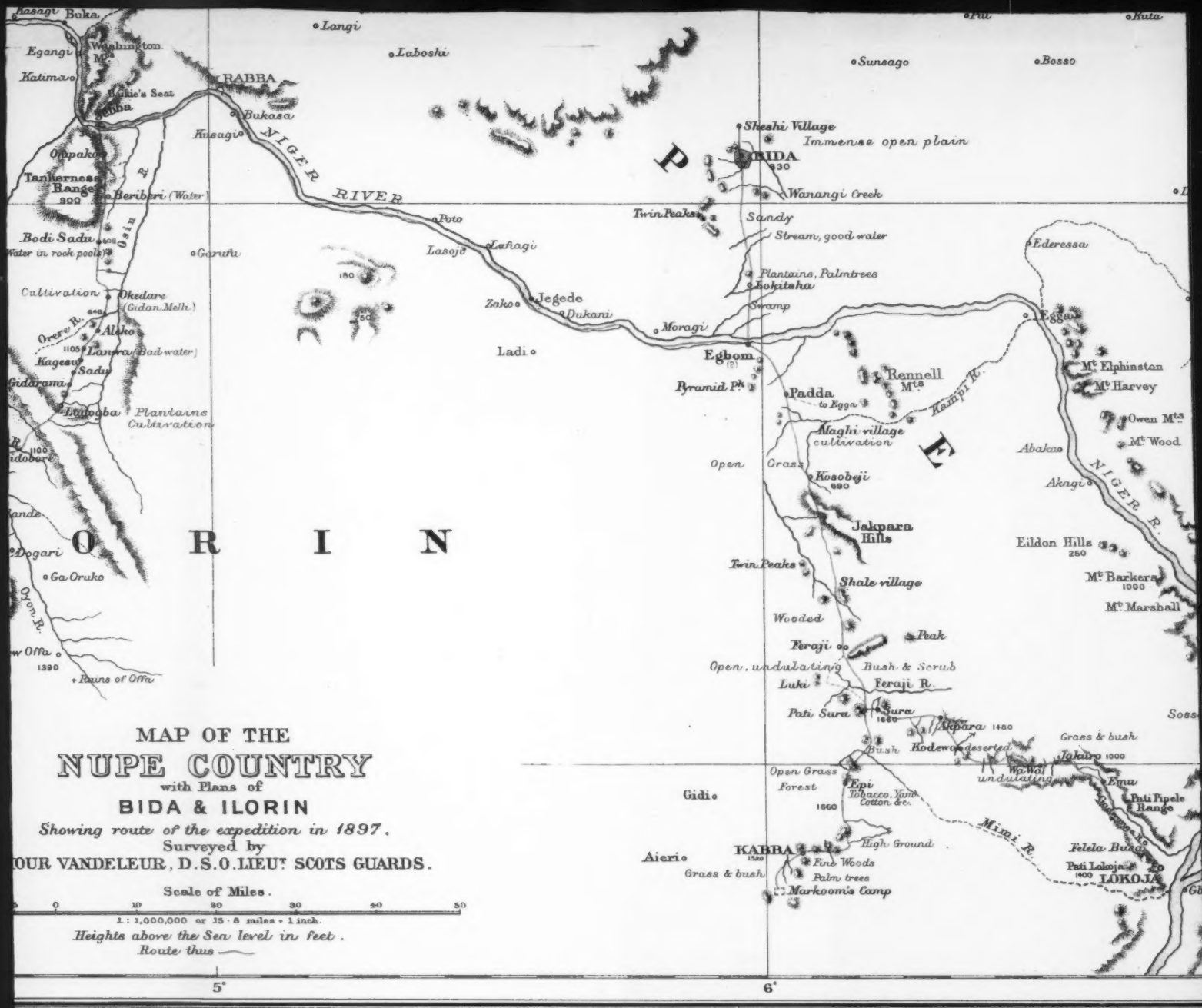

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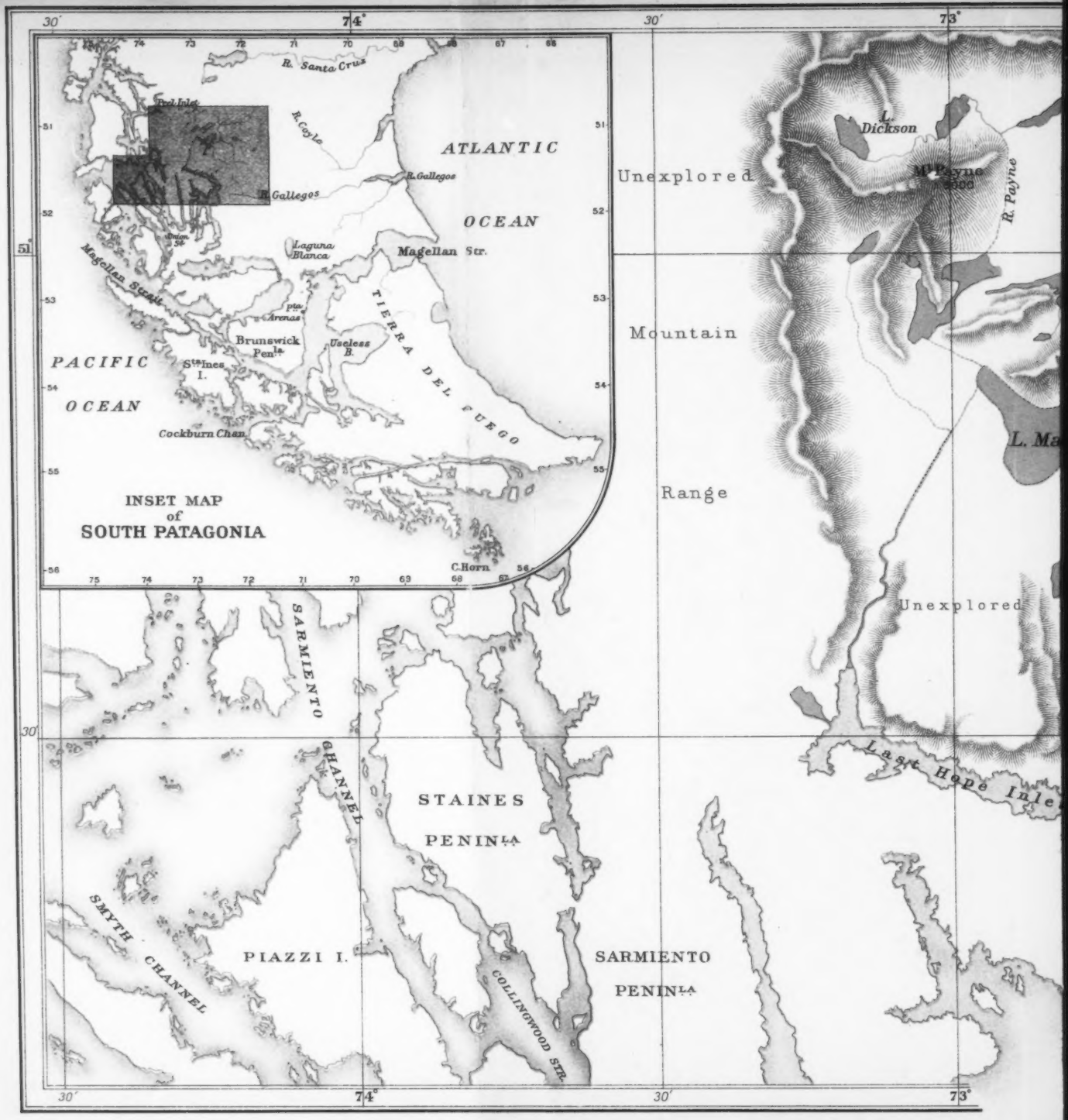

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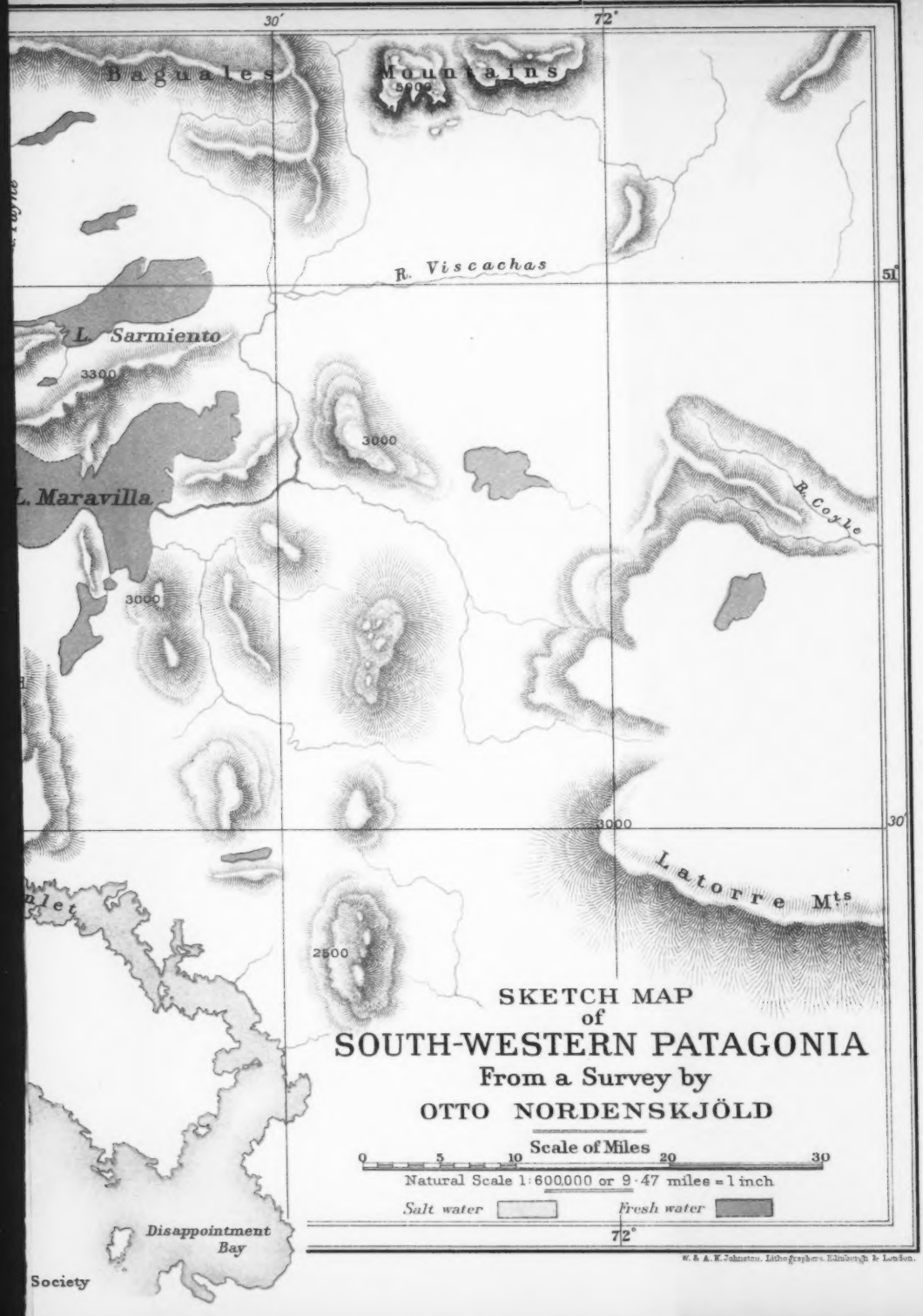
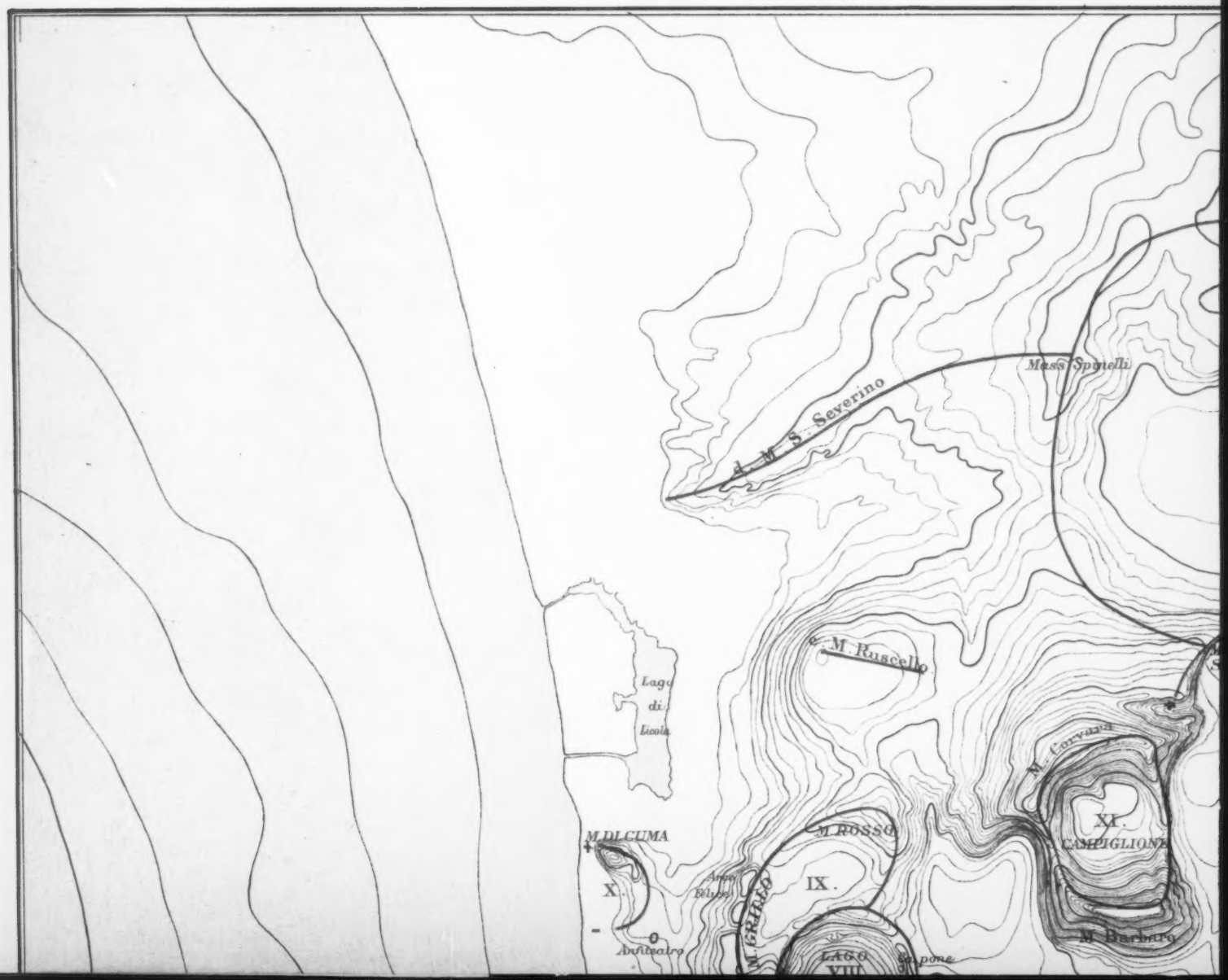


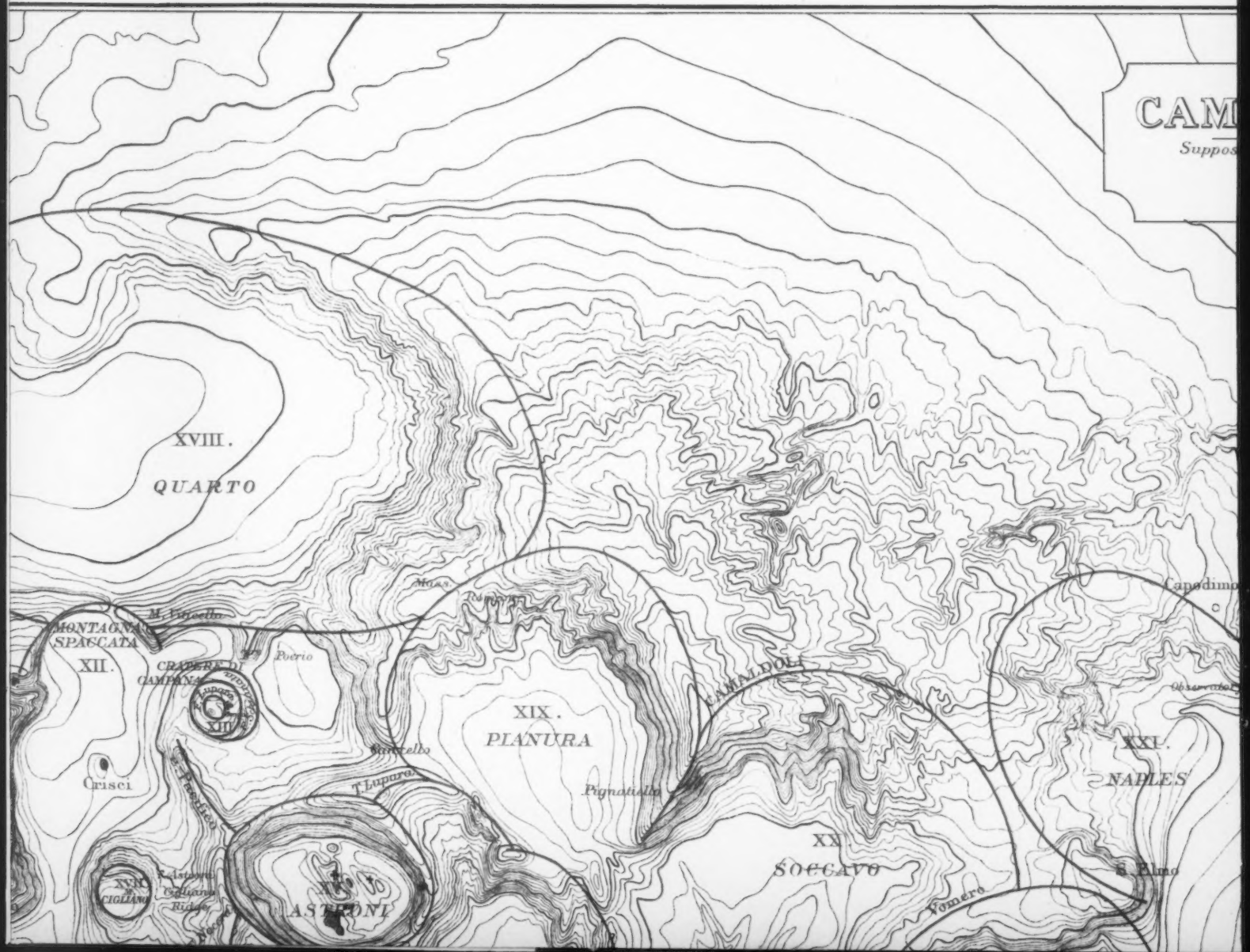
SKETCH MAP
of
SOUTH-WESTERN PATAGONIA
From a Survey by
OTTO NORDENSKJÖLD

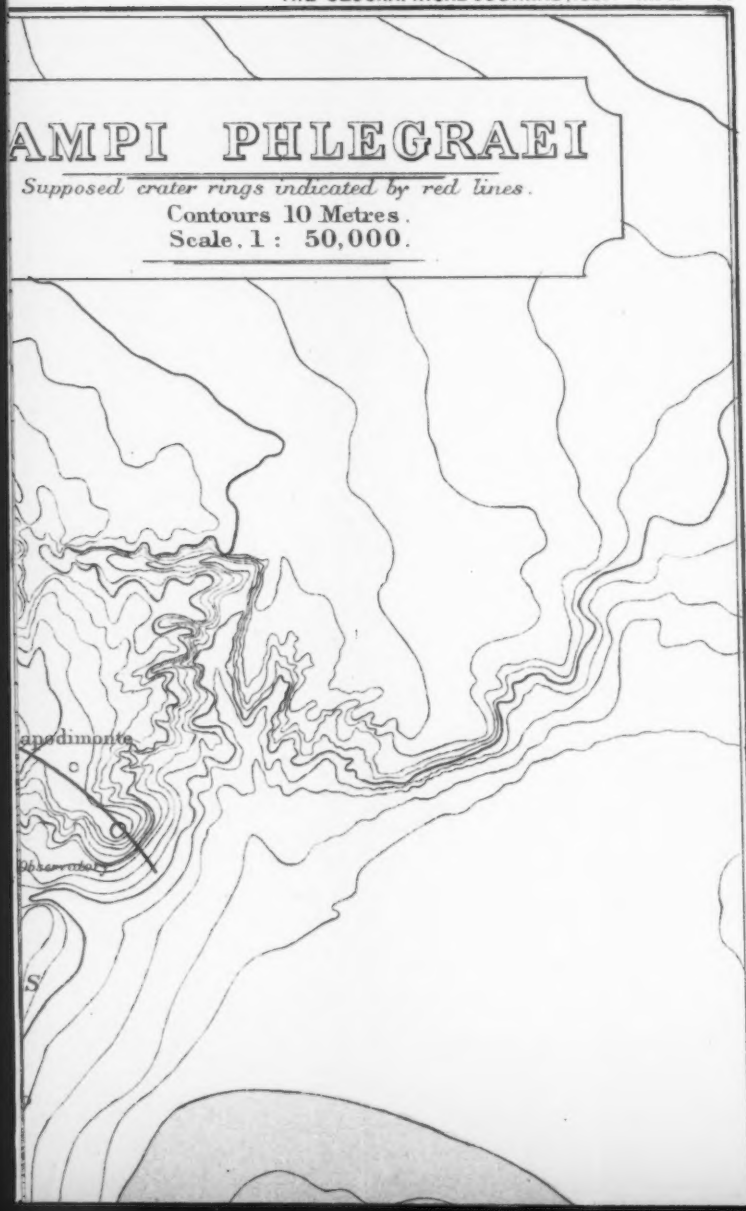
Scale of Miles
0 5 10 20 30
Natural Scale 1:600,000 or 9·47 miles = 1 inch

Salt water *Fresh water*

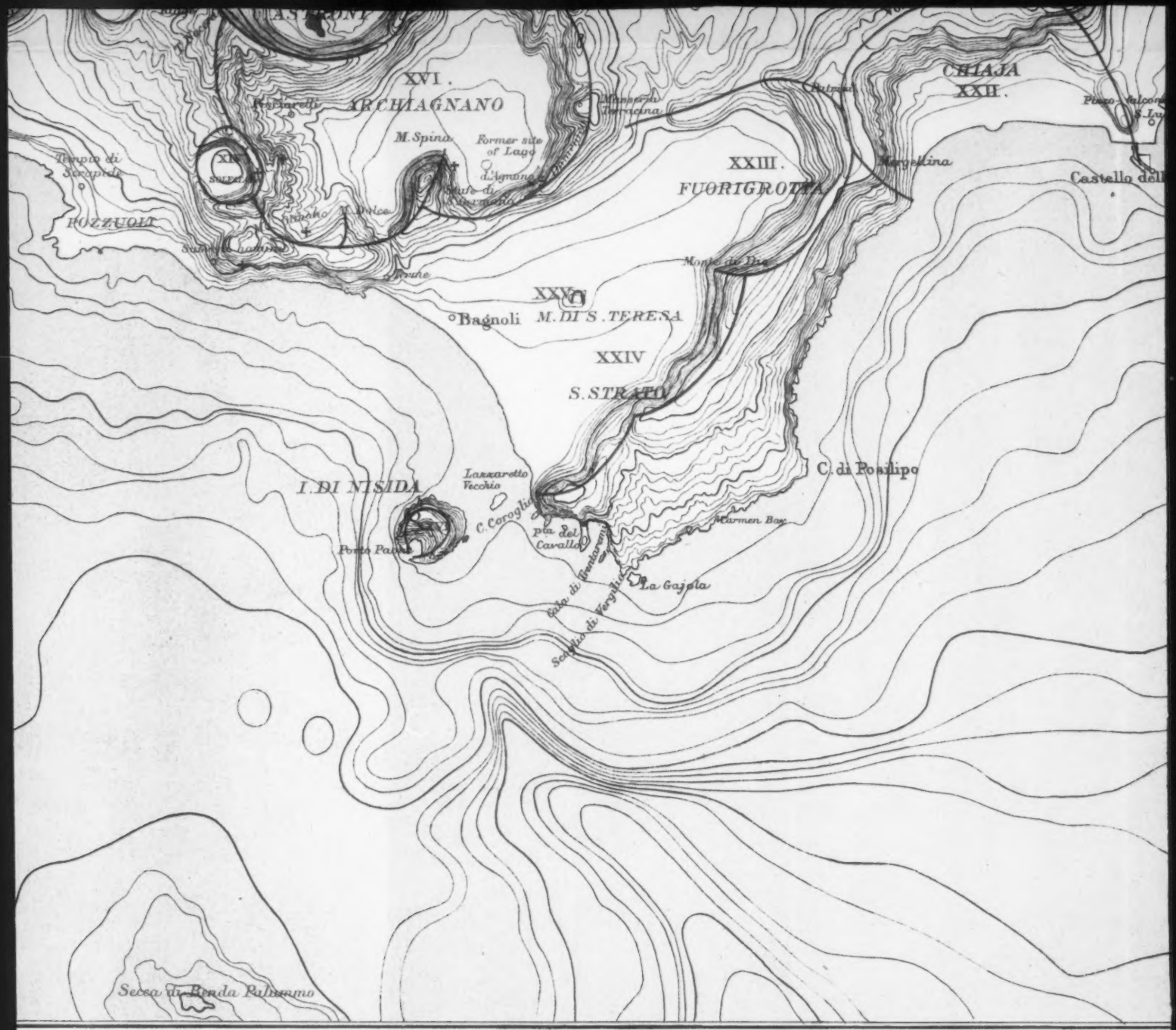
W. & A. K. Johnston, Lithographers, Edinburgh & London.


M. S. Severino
Mass. Spinelli
M. Ruscello
Lago di Licola
M. DI CUMA
M. ROSSO
M. GRIBEO
Arco Felice
Anfiteatro
LAGO
Lucrino
M. Barbaro
IX.
X.
XI.
VIII.


CAM
Suppos
XVIII.
QUARTO
MONTAGNA SPACCATA
XII.
CRATERE DI CAMPANA
Puerio
XIX.
PLANURA
Pignatiello
XX.
SOCCAVO
XXI.
NAPLES
Vomero
S. Elmo
Crisci
ASTRONI
CIGLIANO


AMPI PHLEGRAEI
Supposed crater rings indicated by red lines.
Contours 10 Metres.
Scale, 1 : 50,000.
anadimonte
Observatory
S

Anfiteatro
LAGO
VIII
D'AVERNO
Ponte
M. NUOVO
La Starza
Lucrino
Lago
del
Fusaro
Stufe di Nerone
Fumosa
Pta del Epitaffio
VI.
BAIA
Fortin di Tenaglia
V
Forte
di BAIA
IV
M. Sant'Angelo
Scoglio
di S.
Martino
M. di Procida
III
BACOLI
Mare
Morto
PORTO DI
MISENO
II
I
Pta di Penata
Pta Terone
Montacolo
Pta di Torre Fume
Schiavone
Pta Sequestro
C. DI MISENO
PROCIDA
Secca di Mezzogiorno



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